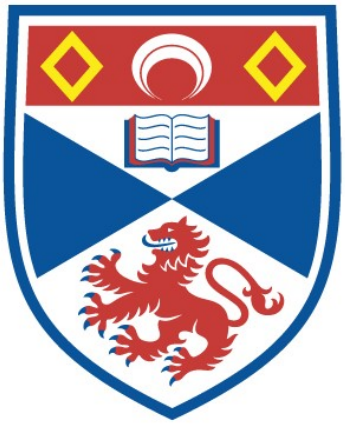
THE ROLE OF SELF-CONTROL IN PRO-ENVIRONMENTAL BEHAVIOUR

Andreea Oniga

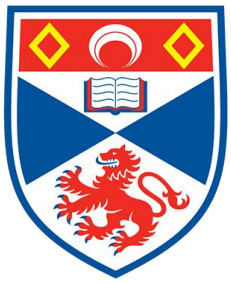
A Thesis Submitted for the Degree of PhD
at the
University of St Andrews



2019

The Role of Self-Control in Pro-Environmental Behaviour

Andreea Oniga



University of
St Andrews

This thesis is submitted in partial fulfilment for the degree of

Doctor of Philosophy (PhD)

at the University of St Andrews

March 2019

Candidate's declaration

I, Andreea Oniga, do hereby certify that this thesis, submitted for the degree of PhD, which is approximately 80,000 words in length, has been written by me, and that it is the record of work carried out by me, or principally by myself in collaboration with others as acknowledged, and that it has not been submitted in any previous application for any degree.

I was admitted as a research student at the University of St Andrews in September 2014.

I received funding from an organisation or institution and have acknowledged the funder(s) in the full text of my thesis.

Date Signature of candidate

Supervisor's declaration

I hereby certify that the candidate has fulfilled the conditions of the Resolution and Regulations appropriate for the degree of PhD in the University of St Andrews and that the candidate is qualified to submit this thesis in application for that degree.

Date Signature of supervisor

Permission for publication

In submitting this thesis to the University of St Andrews we understand that we are giving permission for it to be made available for use in accordance with the regulations of the University Library for the time being in force, subject to any copyright vested in the work not being affected thereby. We also understand, unless exempt by an award of an embargo as requested below, that the title and the abstract will be published, and that a copy of the work may be made and supplied to any bona fide library or research worker, that this thesis will be electronically accessible for personal or research use and that the library has the right to migrate this thesis into new electronic forms as required to ensure continued access to the thesis.

I, Andreea Oniga, confirm that my thesis does not contain any third-party material that requires copyright clearance.

The following is an agreed request by candidate and supervisor regarding the publication of this thesis:

Printed copy

No embargo on print copy.

Electronic copy

No embargo on electronic copy.

Date Signature of candidate

Date Signature of supervisor

Underpinning Research Data or Digital Outputs

Candidate's declaration

I, Andreea Oniga, hereby certify that no requirements to deposit original research data or digital outputs apply to this thesis and that, where appropriate, secondary data used have been referenced in the full text of my thesis.

Date Signature of candidate

Acknowledgements

I would like to thank my supervisors, Dr. Boyka Bratanova, Dr. John Desmond and Dr. Kristian Myrseth, for all their support, advice and guidance throughout my PhD. I would also like to thank the School of Management for funding my PhD project, and to the staff and PhD colleagues in the School of Management.

Finally, I would also like to thank my parents, my sister, my partner and my friends for all their support throughout the last 4 years.

Funding

This work was supported by the School of Management, University of St Andrews.

Abstract

Enhancing individuals' pro-environmental behaviour is a key aspect of climate change mitigation. Despite most individuals endorsing positive environmental motivations, such as attitudes, pro-environmental behaviour uptake remains low. The thesis proposes that one's self-control ability may play a role in their pro-environmental behaviour, by enabling individuals to overcome the obstacles in the way of acting on pro-environmental motivations. This thesis thus explores the relationship between self-control and pro-environmental behaviour, and the practical implications of this relationship, by investigating how self-control strategies can be used as a marketing tool to enhance pro-environmental behaviour.

The first six studies provide evidence that self-control influences pro-environmental behaviour. A consistent, positive relationship between self-control and pro-environmental behaviour is found across three correlational studies. Findings from three experiments further suggest that lower self-control is linked to reduced pro-environmental behaviour, while higher self-control is linked to higher pro-environmental behaviour. Furthermore, self-control and attitudes are shown to predict pro-environmental behaviour together.

The latter five experiments address the implication that enhancing one's self-control may benefit one's pro-environmental behaviour engagement, and explore the use of implementation intentions, a strategy shown to effectively support one's self-control, for promoting pro-environmental behaviour, in a marketing context. As implementation intentions typically involve lengthy manipulations that are not suitable for wider-scale marketing use, this set of studies explores a brief, picture-based format of implementation intentions that is more suitable for marketing application. The first two experiments demonstrate that this implementation intentions format is as effective in influencing behaviour as the conventional format. Next, three field experiments demonstrate that implementation intentions, in this brief format, can effectively enhance pro-environmental behaviour.

The findings contribute to a better understanding of pro-environmental behaviour, by highlighting a novel influence on pro-environmental behaviour, and identifying a new, independent predictor of pro-environmental behaviour. Furthermore, the findings provide practical insights into interventions for promoting pro-environmental behaviour and suggest an effective marketing tool that policy-makers and social marketers could use to promote pro-environmental behaviour on a wide scale.

Table of contents

List of tables

List of figures

Chapter 1: Introduction

1.1 Introduction

Human behaviour plays a significant role in the environmental challenges the world is currently facing (IPCC, 2014a, 2018; UK Government, 2018). Ample scientific evidence suggests that climate change occurs due to greenhouse gas emissions resulting from human activity (Anderegg, Prall, Harold, & Schneider, 2010; Cook et al., 2013; IPCC, 2014a). In this context, numerous countries have adopted the global target to limit global warming to 2°C above pre-industrial levels, a limit beyond which the effects of climate change are predicted to become threatening to human life (IPCC, 2014a; UNFCCC, 2015). Although limiting global temperature changes to 2°C requires a reduction in global greenhouse gas emissions (IPCC, 2014a), these are increasing and are predicted to continue to increase (Hagel, Milinski, & Marotzke, 2017; UNFCCC, 2015). This target appears unlikely to be met given the continually increasing emissions (Hagel et al., 2017; Peters et al., 2017). A recent report by the IPCC (2018) indicates that a limit of 1.5°C, as opposed to 2°C, would have significantly fewer negative consequences on the natural environment, and on individuals from certain areas and countries, who are at a higher risk of negative consequences due to global warming. However, the same report indicates that attaining this less damaging limit would require unprecedented and urgent changes across all areas of society (IPCC, 2018).

Given that individual behaviours and patterns of consumption are one of the key causes of greenhouse gas emissions, individual behaviour change towards more environmentally-friendly behaviour is seen as an integral part of the global effort to mitigate climate change (IPCC, 2014b; UNFCCC, 2015). In this thesis, environmentally-friendly, or pro-environmental behaviours are defined as behaviours that are minimally harmful or beneficial to the environment (Steg & Vlek, 2009). These include actions such as reducing energy use in households, changing travel modes, dietary changes, reducing food waste, choosing longer lasting products or products that are manufactured in an environmentally-friendly manner, recycling or re-using materials, all of which have been shown to lead to substantial reductions in greenhouse gas emissions (Faber et al., 2012; van de Ven, González-Eguino, & Arto, 2018; Wynes & Nicholas, 2017).

Different areas of research have attempted to provide a better understanding of pro-environmental behaviour. Psychological research has focused on better understanding the drivers and psychological determinants of environmentally-friendly behaviour (Swim et al., 2011). Furthermore, research in marketing has also attempted to understand the drivers of more

sustainable consumption and product disposal choices (Carrington, Neville, & Whitwell, 2014). However, despite increased research efforts, as highlighted by the IPCC (2018), more urgent and sustained changes are needed to achieve long-term sustainability.

In this context, this thesis aims to provide insights that can help better understand and more effectively promote individual environmentally-friendly behaviour. In particular, this thesis explores the role of self-control in pro-environmental behaviour, and ways in which marketers and policy makers can draw from this relationship to promote pro-environmental behaviour in an applied context.

The rest of this chapter will explain in more depth the context for the current research, by outlining the importance of addressing climate change, and the role of human behaviour in alleviating climate change. Next, the chapter will outline some of the main strands of pro-environmental behaviour research common across the marketing and psychology literature, and it will situate the current research in the context of existing research. Finally, the chapter will outline the aims and contribution of the thesis, and it will conclude with an outline of the thesis.

1.2 Background to the research: climate change and its consequences

The vast majority of climate change researchers agree that climate change is occurring due to human activity (Cook et al., 2013; IPCC, 2014a). The average global temperature is currently 1°C higher than in 1850, and it is predicted to continue increasing by 0.2°C per decade at the current level of greenhouse gas emissions (IPCC, 2018). The effects of global warming on the environment are already being observed and are expected to intensify in coming years (IPCC, 2018; UK Government, 2018). The effects include extreme weather events such as heat waves, droughts, coastal flooding, cyclones, hurricanes, wildfires and the melting of Antarctic ice sheets (IPCC, 2014a; IPCC, 2018). The consequences also include biodiversity loss and significant damage to eco-systems such as the coral reefs, the Arctic and mountain glaciers (IPCC, 2018). Climate change also poses risks to human health, including reductions in crop yields, the availability of fresh water and increases in pest populations and diseases (IPCC, 2014a). Statistics from the World Health Organisation indicate that 12.6 million people die yearly due to pollution, extreme weather events and climate-related diseases, and that 1 in 4 global deaths is directly linked to climate change (World Health Organisation, 2016).

At a country-level, climate research data indicates that the UK has experienced more heat waves, floods and extended cold periods, and a 1°C average higher temperature between 2004-2015 than between 1951-1990 (ASC, 2016). Current trends suggest that the UK will continue to

experience increased flooding, heavy rains, sea-level rises and loss of low-lying coastal lands, more intense heat extremes, droughts, and loss of biodiversity (ASC, 2016).

However, the impacts of climate change are not evenly distributed across the planet (IPCC, 2018). Areas such as less developed countries, dry-land regions, small-island developing states, and local communities dependent on agricultural or coastal livelihoods are at higher risk of adverse effects of climate change (IPCC, 2018). Furthermore, as a result of global warming, social inequality and poverty are expected to increase in disadvantaged populations (IPCC, 2018). The IPCC (2018) proposes that limiting global warming to 1.5°C, rather than 2°C, would limit the negative impacts of climate change on vulnerable ecosystems and populations.

However, achieving either of these targets requires urgent reductions in greenhouse gas emissions (IPCC, 2018). Emissions have continued growing, despite numerous countries committing to the 2°C target in the Paris Agreement (UNFCCC, 2015), indicating that more intensified actions are required to mitigate the negative effects of climate change (Hagel et al., 2017). Although technological advances that enable more efficient energy use and reductions in emissions are expected to play an important role in mitigating climate change, researchers have also acknowledged that changes in human behaviour will be necessary in order to achieve these targets, since individual behaviours play an important role in climate change (IPCC, 2018; UNFCCC, 2015; van de Ven et al., 2018).

1.3 The role of individual behaviour

Individual behaviour is seen as a significant contributor to the current environmental challenges (Stern, 2011). Several types of behaviour that lead to greenhouse gas emissions will be outlined below, along with sustainable behavioural alternatives shown to have the potential to lead to substantial reductions in emissions.

Food consumption generates a substantial amount of emissions, with agriculture contributing up to 17-18% of global greenhouse gas emissions (Richards, Wollenberg, & van Vuuren, 2018). Individual actions – such as eating locally sourced-food, reducing avoidable food waste, adopting a vegan or vegetarian diet or reducing meat consumption – can significantly contribute to mitigating climate change, by reducing emissions from the livestock industry and land use (van de Ven et al., 2018). For instance, reducing food waste would reduce global emissions between 2011 and 2050 by 2.4%, whereas adopting a vegetarian diet could reduce emissions by 7% (van de Ven et al., 2018). Therefore, food-related sustainable behaviours have high potential to reduce emissions (Wynes & Nicholas, 2017).

The consumption of mass-produced goods also leads to greenhouse gas emissions, through industrial production and distribution processes (Abrahamse & Steg, 2009; Allwood, Cullen, & Milford, 2010; Swim et al., 2011). More sustainable actions include reducing one's consumption, reusing products (which would, in turn, reduce demand for new products), and buying products produced in an environmentally-friendly manner (green, or eco-friendly products) (Wynes & Nicholas, 2017). For example, buying products made from recycled materials and using more efficient technologies can reduce the need for raw materials, which require more energy for processing (Allwood et al., 2010). However, actions such as buying eco-friendly products are generally seen as having a lower environmental impact than actions that would reduce demand for new products, such as reducing one's consumption and reusing products (Wynes & Nicholas, 2017).

Waste-related choices also affect the environment. Waste can have a negative environmental impact, as the landfilling of waste produces significant emissions, or a positive impact, when waste is recycled, which reduces emissions (van de Ven et al., 2018). Recycling helps reduce the consumption of natural resources and energy, by reducing the need to extract, process, and transport raw materials (Swim et al., 2011). Furthermore, using recycled paper, plastic, metal, and glass waste in production processes requires significantly less energy than processing these from raw materials (Allwood et al., 2010; van de Ven et al., 2018). Therefore, the use of recycled materials reduces industrial energy use, and thus leads to lower emissions (Allwood et al., 2010; Swim et al., 2011). Composting organic waste also helps reduce landfill emissions (van de Ven et al., 2018). Increases in recycling are estimated to potentially reduce up to 3.5% of total global emissions by 2050 (van de Ven et al., 2018).

Transportation also contributes to climate change, with almost a third of global emissions resulting from transportation (Allwood et al., 2010; Gardner & Stern, 2008). For instance, owning a car fuelled by petrol, or flying generate substantial emissions (Wynes & Nicholas, 2017). Wynes and Nicholas (2017) suggest that living a car-free lifestyle, avoiding one flight per year, or buying a more efficient car can have a highly positive impact on the environment. Other sustainable transportation alternatives include car clubs, carpool commuting, cycling, having closer holidays, or commuting using public transport (van de Ven et al., 2018).

Another set of behaviours that contribute to climate change pertain to household energy use (Abrahamse & Steg, 2009). For example, 50% of the UK's individual carbon emissions come from heating and electricity use (CCC, 2015), and across the globe, a third of emissions comes from buildings (Allwood et al., 2010). Individual actions that can lower emissions include purchasing green energy, increasing heating or cooling efficiency via wall insulation,

conserving energy by hand-drying clothes, installing solar panels, choosing energy-efficient appliances, using energy-efficient light-bulbs, or washing clothes with cold water (Gardner & Stern, 2008; Wynes & Nicholas, 2017). Van de Ven et al. (2018) also suggest that small thermostat adjustments, such as reducing the thermostat from 21 to 20 °C during the winter, can reduce emissions.

As outlined in this section, a wide range of human behaviours contributes to climate change, with potential to substantially reduce emissions with changes in these areas of behaviour. The adoption of more sustainable behavioural alternatives is therefore an important aspect in limiting climate change (IPCC, 2014b; Steg & Vlek, 2009; Stern, 2011), especially considering that mitigation actions focused on technological advances may be unable to sufficiently reduce emissions from the industry, transportation, and agriculture on their own (Allwood et al., 2010).

1.4 Pro-environmental behaviour and the motivation-behaviour gap

Considering the importance of individual behaviour in limiting climate change, the adoption of pro-environmental behaviours has become a key focus of not only policy makers, but also of researchers (Gifford, Kormos, & McIntyre, 2011; Steg & Vlek, 2009). A primary set of literature pertains to psychology; as human behaviour is causing environmental problems, the implication is that they can be solved by understanding and changing individual behaviour to more environmentally-friendly alternatives (Gifford et al., 2011). Numerous studies have attempted to generate an in-depth understanding of the processes that lead to the adoption of pro-environmental behaviour, with the end goal of understanding how to create interventions to promote pro-environmental behaviour (Steg & Vlek, 2009; Swim et al., 2011). This topic has also been addressed in the marketing literature, considering that many pro-environmental behaviours pertain to consumption. Extensive research has attempted to understanding pro-environmental behaviours relating to consumption, including its drivers and ways to promote it (Carrington et al., 2014). A smaller number of studies has addressed the role of nudges and other social marketing messages in promoting pro-environmental behaviour (Haq et al., 2013; Schubert, 2017). However, a common theme across marketing and psychology research has been a focus on the motivational determinants of green behaviours, such as values (De Groot & Steg, 2007), norms (Stern, Dietz, Abel, Guagnano, & Kalof, 1999), attitudes (Milfont & Duckitt, 2010) and intentions (Bamberg & Möser, 2007) for pro-environmental behaviour, which are considered accurate predictors of behaviour (Fennis, Adriaanse, Stroebe, & Pol, 2011).

Although a plethora of research tackles pro-environmental behaviours, researchers and policy makers have had limited success in encouraging people to become greener (Whitmarsh & O'Neill, 2010). In fact, research across both fields (psychology and marketing) has identified a gap between individuals' motivations to be green (attitudes, values, and intentions) and their behaviour (Carrington et al., 2014). Although people tend to report positive environmental attitudes and intentions to engage in pro-environmental behaviour, pro-environmental behaviour uptake remains low, giving rise to the so-called 'attitude-behaviour gap' (Carrington et al., 2014). This gap is also reflected out-with academic research. Recent EU research indicates that 90% of individuals across all EU countries espouse positive environmental attitudes (European Commission, 2017). In the US, market research has found that 75% of Americans are particularly concerned for the environment, but only 20% make an effort to live in an environmentally-friendly manner all the time (Pew Research Center, 2016). Furthermore, recent research suggests emissions are continuing to grow (Hagel et al., 2017), with the IPCC (2018) highlighting the need for urgent and widespread change at all levels of society, including individual behaviours, in order to achieve climate change targets. This gap between individual motivations and behaviour suggests that, despite the abundance of existing research, many aspects of pro-environmental behaviour are still not well understood.

1.5 Positioning the thesis in the broader field of pro-environmental behaviour research

Much of the research on pro-environmental behaviour has explored motivations for pro-environmental behaviour, assuming that motivational factors directly lead to behaviour (Nielsen, 2017). However, the self-control literature suggests that people's behaviour is determined not only by their motivation, but also by one's ability to overcome obstacles to their desired behaviour, or self-control (Fishbach & Trope, 2005). Therefore, self-control is typically needed for individuals to be able to act on their motivations, and to translate motivations into behaviour (Fishbach & Trope, 2005). As pro-environmental behaviours tend to involve more effort, difficulty, and costs than unsustainable behavioural alternatives (Steg & Vlek, 2009), self-control may be necessary to overcome these obstacles to pro-environmental behaviour. Despite this, the role of self-control in pro-environmental behaviour has been under-studied, and mainly considered at a theoretical level (Nielsen, 2017). This suggests a need to better understand how self-control affects individuals' engagement in pro-environmental behaviour. Therefore, this thesis addresses this issue by exploring the role of self-control in pro-environmental behaviour in a set of correlational and experimental studies.

Beyond addressing this under-explored relationship, this thesis also explores its implications for promoting pro-environmental behaviour: if self-control is required for one to engage in pro-environmental behaviour, one's engagement in pro-environmental behaviour could be supported by enhancing one's self-control. Importantly, the self-control literature provides various strategies that can be utilised to enhance self-control situationally. Despite this, the role of these strategies in supporting pro-environmental behaviour is under-researched, with most empirical findings in the field stemming from other behavioural areas (Nielsen, 2017).

Furthermore, the potential of social marketing to support behaviour change has been highlighted by researchers (Corner & Randall, 2011). Social marketing integrates insights from psychology and marketing in order to reach wider audiences and promote positive behavioural changes on a wide scale (Haq, Cambridge, & Owen, 2013). For example, insights from psychology can be implemented in messages to be disseminated using tools such as advertising (Haq et al., 2013). However, the research evaluating potential social marketing interventions for pro-environmental behaviour is not extensive (Gregory-Smith, Wells, Manika, & Graham, 2014). One of the more prominent approaches in social marketing has been the use of marketing messages based on nudges, or small changes in the context of individual choices (Schubert, 2017). Although nudges have been demonstrated to be effective in a range of health-related behaviour, more studies are needed on actionable, effective green nudges (Byerly et al., 2018; Lehner, Mont, & Heiskanen, 2016).

Given that social marketing has the potential to reach wider audiences to achieve behaviour change, utilising self-control strategies as nudges in social marketing messages, may prove an effective way to enhance pro-environmental behaviour, by enhancing one's self-control. Therefore, this thesis also seeks to explore how self-control strategies can be implemented to nudge behaviour in a social marketing approach.

Although numerous self-control strategies have been explored, they are typically implemented via lengthy procedures in the laboratory, which would not be suitable for a wider scale application in a marketing context, where people have limited attention for promotional messages (Hoffman & Daugherty, 2013). However, one strategy with potential to be successfully implemented in a marketing format is implementation intentions, which has successfully been used in numerous psychology interventions for behaviours that require self-control, such as healthy eating, dieting, or exercising (Gollwitzer, 1996; Gollwitzer & Sheeran, 2009). Implementation intentions typically involves a manipulation that requires individuals to form or repeat sentences, although evidence suggests that it might be suitable for a marketing approach (Fennis et al., 2011). Despite its potential usefulness as a marketing tool, its marketing

application is under-researched. Therefore, this thesis explores a brief format for implementation intentions, suitable for use as a marketing tool to promote pro-environmental behaviour. The current research addresses the effectiveness of implementation intentions used in this brief format, as well as their usefulness for enhancing pro-environmental behaviour.

1.6 Thesis aims

The main aims of this thesis are to better understand how self-control influences pro-environmental behaviour, and, based on this relationship, to understand how self-control strategies can be used as a marketing tool to enhance pro-environmental behaviour. The objectives of the thesis are:

1. To outline a new conceptual influence on pro-environmental behaviour, based on a comprehensive review of relevant literature.
2. To explore the role of self-control in pro-environmental behaviour, in order to develop new insights on factors that influence pro-environmental behaviour.
3. To address the theoretical implications of the relationship between self-control and pro-environmental behaviour, by reviewing self-control strategies with potential to enhance pro-environmental behaviour.
4. To explore the practical implications of the relationship between self-control and pro-environmental behaviour, by exploring the use of a self-control strategy to enhance pro-environmental behaviour.
5. To help better understand how implementation intentions, a self-control strategy, can be utilised in a marketing format.

1.7 Contributions

Given the complex nature of pro-environmental behaviour, and the complex and varied research on pro-environmental behaviour, this thesis draws on and contributes to three areas of the literature.

First, the thesis contributes to the pro-environmental behaviour literature, by helping to better understand psychological drivers of pro-environmental behaviour. The research provides evidence that self-control influences pro-environmental behaviour, a relationship that has been overlooked in the literature. An implication of this relationship is that marketers and policy makers may draw on insights from the self-control literature to help enhance individual self-control, which in turn should lead to enhanced pro-environmental behaviour. The research also provides evidence in support of this implication. The second set of findings indicate that the use of a strategy to enhance individual self-control (implementation intentions) can enhance pro-

environmental behaviour, in a short format applicable in marketing. Therefore, the studies in this thesis also contribute to the literature by providing evidence on interventions that can enhance pro-environmental behaviour.

Secondly, this set of studies add to the self-control literature, by revealing another set of difficult behaviours for which self-control is beneficial. Self-control is already documented to support a series of beneficial behaviours, such as healthy eating, academic performance, or pro-social behaviour (de Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012), and the current research presents an opportunity to further strengthen the evidence for its positive effects on a range of domains of human life.

Third, the thesis also contributes to the literature on implementation intentions, by providing evidence that implementation intentions can be applied effectively in a brief format suitable for marketing contexts. The thesis thus also advances the marketing application of implementation intentions, which is, perhaps surprisingly, under-researched (Fennis et al., 2011). The current set of studies explores a new format for implementation intentions that has potential for wide-scale application to nudge a broader range of green behaviours, or other types of beneficial behaviours. More broadly, this research also extends the literature documenting the versatility of implementation intentions in enhancing a wide range of beneficial behaviours.

Finally, the research also contributes to the marketing literature by providing insights related to a potential nudge for pro-environmental behaviour, which can be used in a social marketing context. Nudges have been explored as potential tools that can enhance engagement in pro-environmental behaviour, with a growing literature that aims to identify practical nudges for pro-environmental behaviour (Schubert, 2017). The findings in this thesis advance a new nudge that can be used to promote pro-environmental behaviour, and that can be applied on a wider scale as a marketing tool.

Overall, the range of findings in this thesis should help better understand and more effectively promote pro-environmental behaviour, bearing practical relevance to policy makers, researchers and marketers.

1.8 Outline of the thesis

The thesis includes six chapters that provide an understanding of the relationship between self-control and pro-environmental behaviour, and how pro-environmental behaviour can be enhanced, by enhancing individual self-control in marketing interventions.

Chapter 1 introduces the topic, highlighting the broader context of the research and the importance of individual pro-environmental behaviour in this context. This chapter also highlights the research gaps identified and outlines the aims that the research sets out to achieve.

Chapter 2 provides a comprehensive review of the most prominent theoretical models exploring motivational determinants of pro-environmental behaviour. Building on this research, and on current challenges in enhancing pro-environmental behaviour, the chapter proposes a novel influence on pro-environmental behaviour: self-control. The chapter then reviews key literature on the mechanisms of self-control, highlights theoretical links between self-control and pro-environmental behaviour, and identifies a gap in the pro-environmental behaviour literature in relation to self- control.

Chapter 3 identifies a set of hypotheses based on the literature reviewed in Chapter 2, and empirically explores the relationship between self-control and pro-environmental behaviour. The chapter includes 3 correlational studies that explore the linear relationship between self-control and pro-environmental behaviour, and 3 experimental studies that explore the causal role of self-control on pro-environmental behaviour. For each study, the chapter includes an overview of its purpose, methodology, findings and discussion of the findings, with a final discussion of the six studies taken together at the end of the chapter.

Building on findings from Chapter 3, Chapter 4 addresses the implications of the relationship between self-control and pro-environmental behaviour. The chapter proposes the use of self-control strategies in marketing, to enhance pro-environmental behaviour, and reviews some of the most commonly researched self-control strategies, with a view to identifying self-control strategies applicable in marketing interventions. Implementation intentions are identified as a self-control strategy with high potential to influence pro-environmental behaviour when used in marketing, and their use in a marketing format is proposed based on the relevant literature reviewed.

Chapter 5 proposes a set of hypotheses regarding the use of implementation intentions in a marketing format, to promote pro-environmental behaviour. The chapter then empirically tests the application of implementation intentions in a marketing format, and their usefulness in enhancing pro-environmental behaviour, in 5 experimental studies, including 2 online experiments and 3 field experiments. As in Chapter 3, the purpose, methodology, findings and a discussion of the findings for each study are outlined, followed by a final discussion of the integrated findings.

Chapter 6 addresses the overall conclusions that can be drawn from the research. The chapter summarises the findings of this thesis, alongside its key contributions and implications. This chapter also explores the limitations of the research and future areas for investigation, as well as considerations related to the broader context in which these findings can be utilised.

Chapter 2: Literature review: pro-environmental behaviour and self-control

2.1 Introduction

Overwhelming scientific evidence indicates that unsustainable human behaviour is at the root of the environmental threats the world is facing (IPCC, 2014a). Therefore, to mitigate these threats, there is an urgent need for individuals to adopt pro-environmental behaviours on a wide scale (Stern, 2011). Given the importance of adopting individual pro-environmental behaviours in alleviating current environmental problems, pro-environmental behaviour has gained significant attention from researchers (Kollmuss & Agyeman, 2002).

A large part of the research has focused on providing a better understanding of the psychological drivers of pro-environmental behaviour, with a particular focus on factors that motivate pro-environmental behaviour, such as environmental attitudes (Milfont & Duckitt, 2010), moral norms (De Groot & Steg, 2009), social norms (Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007), values (De Groot & Steg, 2010), environmental self-identity (Whitmarsh & O'Neill, 2010), and morality (Bratanova, Loughnan, & Gatersleben, 2012). These are seen as essential in informing the creation of more effective interventions for promoting pro-environmental behaviour (Steg & Vlek, 2009).

Furthermore, although research and market studies report increasing levels of environmental concerns, values and attitudes (European Commission, 2017; Gleim & Lawson, 2014), individuals with environmental concerns do not always act in accordance with their own concerns (Gifford et al., 2011). This gap between individuals' environmental motivations and their behaviour is well recognised in the literature, under the terms 'attitude-behaviour' gap, 'intention-behaviour gap' or 'value-action gap' (Carrington et al., 2014; Gifford et al., 2011; Kollmuss & Agyeman, 2002). Despite efforts from researchers and policy makers, accelerating the uptake of pro-environmental behaviour remains a pressing concern, particularly as little progress has been reported in recent years on reducing global greenhouse gas emissions, one of the key causes of environmental problems (IPCC, 2014a).

This suggests that new insights are needed, moving from attitudes and intentions, to the enactment of behaviour. Research indicates pro-environmental behaviour entails numerous obstacles, which can prevent individuals from acting on their motivations (Gleim, Smith, Andrews, & Cronin, 2013). Self-control theory suggests that individuals require self-control in order to overcome obstacles in the way of their longer-term goals and desires. This suggests that

self-control may help individuals overcome the attitude-behaviour gap in order to act on their pro-environmental motivations. However, to date, the role of self-control in pro-environmental behaviour has been understudied, and limited mainly to theoretical papers suggesting further research (Nielsen, 2017). As such, this chapter will attempt to better understand the potential role of self-control in pro-environmental behaviour, by reviewing the relevant literature and identifying new avenues for research.

This chapter will first provide an overview of the research on motivational factors involved in pro-environmental behaviour. Following this, the chapter will explore self-control as an area of potential for new research on pro-environmental behaviour, based on which it will outline the aims and structure of the empirical studies in the next chapter.

2.2 Pro-environmental behaviour and motivation

Motivational drivers of pro-environmental behaviour have been a longstanding focus of pro-environmental behaviour researchers (Steg & Vlek, 2009). Motivation is defined as a strong behavioural driver, or a reason for behaviour (Wilkie, 1990). From this point of view, identifying individuals' motivation for engaging in pro-environmental behaviour should enable the development of more effective interventions, that would enhance these motivations (Thøgersen & Ölander, 2006). This section will review some of the main motivational factors researched in relation to pro-environmental behaviour, with the aim to providing a better understanding of the context for the current research.

2.2.1 Environmental attitudes

Environmental attitudes are amongst the most researched motivations for pro-environmental behaviour (Carrington, Neville, & Whitwell, 2010), with over 50% of published research by 2010 addressing attitudes (Milfont & Duckitt, 2010; Milfont, Duckitt, & Cameron, 2006). Attitudes are conceptualised as an individual's tendency to evaluate an object, concept or behaviour favourably or unfavourably, and are presumed to influence an individual's behaviour (Ajzen & Fishbein, 2000). General environmental attitudes are defined as "a psychological tendency expressed by evaluating the natural environment with some degree of favour or disfavour" (Milfont & Duckitt, 2010, p.80). Environmental attitudes have also been referred to as "environmental concern" in the literature (Dunlap & Jones 2002; Milfont & Duckitt, 2004) as environmental concern is conceptualised as a general attitude involving environmental protection (Bamberg, 2003).

A vast range of empirical studies indicates that general environmental attitudes are positively associated with pro-environmental behaviour (Milfont & Duckitt, 2004), although the

measurement of environmental attitudes has not been consistent throughout the literature. Different operationalisations have been used, amongst which the most common scale measure is the New Environmental Paradigm (NEP) scale (Dunlap, Van Liere, Mertig, & Emmet Jones, 2000; Hawcroft & Milfont, 2010). The NEP assesses five domains of beliefs about humans in relation to the natural environment: the existence of limits for societal growth, anti-anthropocentrism, the fragility of nature's balance, rejection of the idea that humans are exempt from the constraints of nature, and the possibility of an eco-crisis or ecological catastrophe (Dunlap et al., 2000). Other, less popular measures include the Environmental Concern Scale (Weigel & Weigel, 1978) or Milfont and Duckitt's (2010) Environmental Attitude Inventory. Although other environmental attitude measures have also been shown to correlate with pro-environmental behaviours (Bamberg, 2003; Mancha & Yoder, 2015; Milfont & Duckitt, 2010; Shin, Moon, Jung, & Severt, 2017), the majority of research findings have been focused on the NEP. The NEP has been shown to predict pro-environmental behaviour in numerous studies on various domains of pro-environmental behaviour, such as general environmental behaviour measures, intentions to purchase green energy, recycling, green consumption and others (Casey & Scott, 2006; Ebreo, Hershey, & Vining, 1999; Gatersleben, Murtagh, & Abrahamse, 2014; Husted, Russo, Meza, & Tilleman, 2014; Liu et al., 2018; Mobley, Vagias, & DeWard, 2010; Olli, Grendstad, & Wollebaek, 2001; Roberts & Bacon, 1997; Robinson, Downey, Ford, Lomas, & Stough, 2019; Whitburn, Linklater, & Milfont, 2018). For example, Casey and Scott (2006) explored the relationship between the NEP and a general measure of pro-environmental behaviour (including behaviours such as recycling, saving water, electricity and others), and found that the NEP significantly predicted behaviour between the NEP and behaviour ($\beta = .45$, $R^2 = .20$), whereas Mobley et al. (2010) found that the NEP positively correlated with a similar measure of pro-environmental behaviour ($r = .46$). More recently, Robinson et al. (2019) confirmed this relationship in a sample of adolescents ($r = .32$) and found that environmental attitudes predicted pro-environmental behaviour ($\beta = .33$, $R^2 = .10$).

Much of this research is based on the assumption that environmental attitudes have a direct causal effect on behaviour (Bamberg & Möser, 2007). However, evidence indicates that there is large variation in the relationship between environmental attitudes and behaviour (Dunlap et al., 2000), with many studies finding no relationships between environmental attitudes and behaviour (Huang, 2016; Mainieri, Barnett, Valdero, Unipan, & Oskamp, 1997; Prati, Albanesi, & Pietrantoni, 2017; Schultz & Oskamp, 1996; Tobler, Visschers, & Siegrist, 2012). For example, Mainieri et al. (1997) found that environmental concern did not predict any of the environmental behaviours measured, including recycling, using public transportation, saving water or energy. Similarly, Prati et al. (2017) explored the effects of environmental attitudes

(measured using the NEP) on behaviour in a longitudinal study, and found that environmental attitudes did not predict subsequent pro-environmental behaviour (measured using a composite measure of behaviours such as reducing air-conditioning, heating, and lighting). Other studies highlight variable results between different types of behaviours. Tobler et al. (2012) found that environmental concern had an effect only on lower cost pro-environmental behaviours, such as saving water or consuming seasonal food, but no significant effects on higher cost behaviours, such as those related to transportation e.g., avoiding commuting by car or avoiding flights. Similarly, Huang (2016) found that the NEP had no direct effects on behaviours that require individuals to take actions, such as recycling, buying local products, reducing meat consumption and reducing driving. However, in this study, the NEP was related to indirect behaviours related to searching information about pro-environmental behaviour or environmental civic engagement (Huang, 2016).

A possible explanation for this inconsistency in findings on environmental attitudes research is that various behavioural obstacles can prevent attitudes from transforming into certain behaviours (Tobler et al., 2012). In support of this, Gatersleben, Steg, and Vlek (2002) argue that environmental attitudes are more relevant for behaviours that do not involve substantial effort. Another critique of environmental attitudes is that, as a general evaluation of environmental protection, they are conceptually more distant from behaviour than specific attitudes to that behaviour (Bamberg, 2003). Bamberg (2003) argues that general environmental attitudes influence specific attitudes, which in turn more closely influence behaviour.

Furthermore, the research typically employed is correlational in nature, which does not necessarily imply that attitudes have a causal role on behaviour. However, several studies have explored interventions based on the assumption that increasing individuals' knowledge about environmental problems or actions that one can take to become more environmentally-friendly should lead to more positive attitudes, which should, in turn, affect behaviour (Steg & Vlek, 2009). The findings of these experimental studies generally suggest that interventions based on the provision of information do not typically influence behaviour (Stern, 1999). Several meta-analyses regarding household energy saving suggest that providing information, on its own, does not effectively promote energy saving (Abrahamse, Steg, Vlek, & Rothengatter, 2005; Delmas, Fischlein, & Asensio, 2013). A recent study (Howell, 2014) found that providing environmental information in a movie increased environmental attitudes and intentions, but had no effects on self-reported behaviour in the long term. This suggests that even if information may influence predictors of pro-environmental behaviour such as attitudes or intentions, these do not necessarily turn into behaviours.

As such, although attitudes are commonly regarded as an important motivation for pro-environmental behaviour (Bamberg, 2003), the research is inconclusive as regards their usefulness in influencing behaviour. Although numerous studies highlight the role of general attitudes in pro-environmental behaviour, other studies provide null results. Furthermore, the limited research on interventions suggests that changing attitudes does not necessarily lead to behaviour changes.

2.2.2 The theory of planned behaviour

Environmental behaviour research has also explored more specific attitudes to pro-environmental behaviour, particularly in the context of the Theory of Planned Behaviour (TPB), which incorporates other influences alongside attitudes, to more efficiently predict behaviour (Ajzen & Fishbein, 1977). The TPB is one of the most popular theories used to explain behaviour, not only in pro-environmental behaviour research, but also in marketing and psychology research (Carrington et al., 2010). According to the TPB, intentions to engage in a behaviour are a key predictor of that behaviour; these are determined by attitudes, subjective norms and perceived behavioural control (Ajzen, 1991). As specific attitudes are regarded as more closely related to behaviour than general attitudes, the TPB includes specific attitudes, defined as one's overall evaluation of the examined behaviour (Ajzen, 1991). Subjective norm refers to an individual's perceived social pressure to perform the behaviour, based on the perceived expectations of the social groups they see as important and perceived behavioural control refers to an individual's perception regarding his or her own ability to perform the behaviour (Ajzen, 1991). Therefore, as part of this model, attitudes do not predict behaviour directly, but rather indirectly, through intentions (Bamberg, 2003).

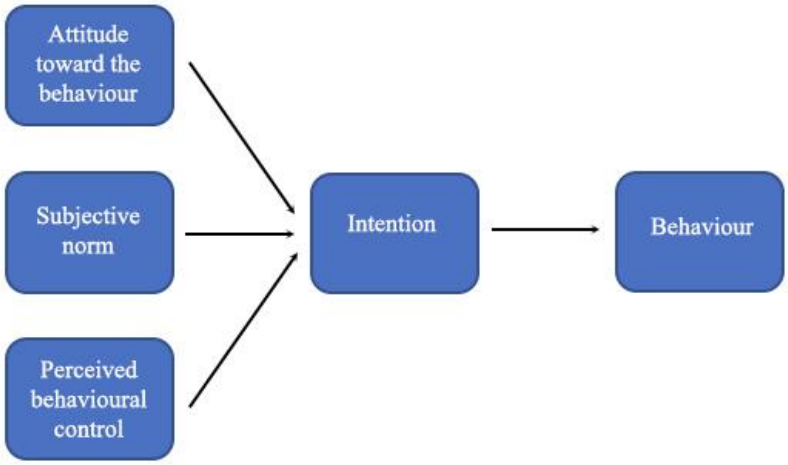


Figure 1. The theory of planned behaviour (adapted from Ajzen, 1991, p. 182)

Numerous pro-environmental behaviours have been researched using the TPB (Bamberg, 2003; Bamberg & Möser, 2007; de Leeuw, Valois, Ajzen, & Schmidt, 2015), including recycling (Knussen, Yule, MacKenzie, & Wells, 2004; Mannetti, Pierro, & Livi, 2004; Nigbur, Lyons, & Uzzell, 2010; Tonglet, Phillips, & Bates, 2004), organic food consumption (Arvola et al., 2008), green energy savings (Chen, 2016), tourists' pro-environmental behaviour (Wang, Zhang, Yu, & Hu, 2018) and green purchase behaviour (Albayrak, Aksoy & Caber, 2013). For instance, Yadav and Pathak (2017) found that the elements of the TPB predicted intentions to buy green products, which in turn predicted behaviour. Specific attitudes to buying green products were also correlated with green product buying behaviour (r = .42) (Yadav & Pathak, 2017). Similarly, Morten, Gatersleben and Jessop's (2018) findings also support the TPB's ability to predict intentions to reduce the number of flights taken for leisure purposes. Furthermore, in this study, attitudes were also significantly correlated with past pro-environmental behaviour (r = .34) (Morten et al., 2018). De Leeuw et al. (2015) also found support for the ability of the TPB to predict behaviour, and found a significant positive correlation between attitudes towards pro-environmental behaviour, and a general measure of pro-environmental behaviour (r = .38).

In this research, attitudes are consistently found to play a significant role in predicting or explaining pro-environmental behaviour intentions, with attitudes consistently displaying the strongest association, of all the TPB elements, with intentions (Bamberg, 2003; Yadav & Pathak, 2017). Unsurprisingly, the literature thus tends to emphasise the important role of attitudes in understanding behaviour, with attitudes being regarded as a strong motivation to engage in pro-environmental behaviour (Lindenberg & Steg, 2007).

The use of the TPB has also been extensively criticised, mainly due to the low correspondence typically found between intention and behaviour. Several meta-analyses on intention-behaviour relations in other behavioural domains indicate that intentions explain 27-28% of variance in behaviour, suggesting that the constructs involved in the TPB may have a limited role in explaining behaviour (Armitage & Conner, 2001; Sheeran, 2002). Similarly, in the environmental domain, Bamberg and Möser's (2007) meta-analysis on the use of TPB to predict pro-environmental behaviour indicates that intentions explain 27% variance of self-reported pro-environmental behaviour.

These findings reflect the green intention-behaviour gap (Carrington et al., 2010). Despite increasingly positive environmental attitudes and intentions, it has been widely recognised that individuals do not, for most part, act on these intentions (Carrington et al., 2014; Nigbur et al., 2010). One aspect that research using this model does not fully acknowledge, similar to research on general environmental attitudes, pertains to the barriers that individuals may face when

attempting to engage in environmentally-friendly behaviour, which may help explain the low correspondence between intentions and behaviour (Gardner & Stern, 1996).

Furthermore, there is a lack of clarity regarding how these findings can be used in interventions aimed at influencing behaviour (Sniehotta, Presseau, & Araújo-Soares, 2014). The majority of research focuses on behavioural predictions, or predictions of intentions, rather than on interventions based on these constructs. A limited number of experimental studies employing interventions based on constructs of the TPB are in fields other than pro-environmental behaviour and were not successful in changing behaviour, but rather only attitudes to the behaviours explored (Chatzisarantis & Hagger, 2005; Sniehotta, 2009). For instance, Chatzisarantis and Hagger (2005) developed persuasive communication messages based on the TPB, for promoting physical activity. Although participants reported higher attitudes towards physical exercise following the intervention, this did not increase their physical activity participation. In a different study, Momsen and Stoerk, (2014) investigated the priming of intentions to choose renewable energy, but found that this did not have a significant effect on consumer choices between conventional and renewable energy, compared to a control.

Similar to general environmental attitudes, TPB research on pro-environmental behaviour is subject to debate, with inconclusive findings regarding its usefulness in predicting behaviour. Furthermore, the research focuses on predictive models rather than interventions, leaving much unanswered about the ability of attitudes to influence behaviour.

2.2.3 Values

Another motivational driver that has been extensively researched in relation to pro-environmental behaviour is values (Steg & Vlek, 2009). Values are defined as enduring beliefs about what is fundamentally important, presumed to guide one's actions (Schwartz, 1992). Values represent criteria that influence the attitudes and behaviours of individuals, and tend to be stable over time (Rokeach, 1973; Schwartz, 2012).

In relation to pro-environmental behaviour, self-transcendent values have been found to influence pro-environmental behaviour (Gifford & Nilsson, 2014; Schwartz, 1992). Schwarz (1992) classifies values on a continuum between self-enhancement (values related to hedonism, power and achievement) and self-transcendence (related to benevolence, altruism and concern for the welfare of others and of nature). Substantial evidence links self-enhancement values with lower pro-environmental behaviour and intentions, whilst self-transcendent values are shown to be linked to higher pro-environmental behaviour intentions (Hedlund, 2011; Stern & Dietz, 1994; Thøgersen & Ölander, 2002).

Schwartz's (1992) value classification has also been adapted into three sets of value orientations that are presumed to influence environmental beliefs and behaviour: egoistic, altruistic and biospheric values (De Groot & Steg, 2007; Stern & Dietz, 1994). Egoistic value orientations focus on one's self-interest, whereas altruistic values reflect concern for the wellbeing of others and biospheric values focus on the intrinsic value of the environment and the biosphere (De Groot & Steg, 2007; Schultz & Zelezny, 1999; Stern, 2000). In this perspective, values that concern the environment (biospheric) are differentiated from other self-transcendent values, such as altruistic values (Gifford & Nilsson, 2014). Research indicates that consumers who express stronger biospheric values tend to be more concerned about the environment, and express higher environmental attitudes and intentions, while egoistic values are negatively related to pro-environmental tendencies (De Groot & Steg, 2007; Ruepert, Keizer, & Steg, 2017; Stern, 2000; Stern & Dietz, 1994).

However, across the research, values tend to be regarded as a more distant influence on behaviour that affects other predictors of behaviour (Shin et al., 2017). For example, in Shin et al.'s (2017) study, biospheric values were not directly related to willingness to pay more for an organic menu, but rather influenced behaviour through environmental attitudes.

Furthermore, researchers have emphasised the role of self-identity, or the label that individuals use to describe themselves (Cook, Kerr, & Moore, 2002). Environmental self-identity is defined as the extent to which one sees oneself as the type of person who acts environmentally-friendly (van der Werff, Steg, & Keizer, 2013). Van der Werff et al. (2013) and Gatersleben et al. (2014) found that the relationship between biospheric values and pro-environmental behaviour is mediated by environmental self-identity. These findings suggest that biospheric values influence behaviour by strengthening one's environmental self-identity. Environmental self-identity has also been shown to directly predict pro-environmental behaviours such as energy, transportation, waste reduction, recycling, and eco-consumption (Gatersleben, Murtagh, Cherry, & Watkins, 2017; Mannetti et al., 2004; Nigbur et al., 2010; van der Werff et al., 2013; Whitmarsh & O'Neill, 2010). However, despite the promising results related to environmental self-identity, it is not yet clear how it can be used in interventions to influence pro-environmental behaviour (Bratanova et al., 2012).

Furthermore, as regards interventions utilising values to influence behaviour, changing values may be more challenging than changing attitudes, since values tend to be stable over time (Schwartz, 1992). However, research has explored the situational activation of environmental values, based on the assumption that values can operate unconsciously to influence behaviour, when activated by elements in the environment of individuals (Verplanken & Holland, 2002).

Verplanken and Holland (2002) activated environmental values through priming in an unrelated task, and found that when participants endorsed environmental values, these did not translate into behaviour (e.g., charitable donations or self-reported voting behaviour) unless environmental values were experimentally activated. Verplanken and Holland (2002) argue that values can also be activated when they are the focus of attention (e.g., in discussions about a topic related to the values in question), when they are implied by the situation, or the information that a person is faced with. Similarly, Hahnel, Ortmann, Korcaj and Spada (2014) found that priming environmental values leads to more positive evaluations of electric vehicle costs. However, in a field experiment, Nolan, Schultz, Cialdini, Goldstein and Griskevicius (2008) found that egoistic and environmental-protection-based messages appeals were not effective in influencing energy saving behaviour. If values can be activated by information, as Verplanken and Holland (2002) suggest, messages based on environmental protection should activate relevant values. However, Nolan et al.'s (2008) findings suggest that the use of values in persuasive messages may be not always be effective.

Although values provide important insights into what drives pro-environmental behaviour, as with attitudes, a large part of this research is of a correlational nature, which does not demonstrate the causal role of values on behaviour. Considering the limited empirical findings regarding interventions based on values and value activation, it is still not clear to what extent they can be utilised to promote pro-environmental behaviour.

2.2.4 Moral norms

Pro-environmental behaviour research has also considered the role of moral norms, as direct predictors of pro-environmental behaviour (Stern, 2000). Moral norms refer to feelings of moral obligation to behave in a certain way (Onwezen, Antonides, & Bartels, 2013), and have primarily been researched as part of models such as the value-belief-norm (VBN) theory, which also incorporates values (Stern, 2000; Stern et al., 1999). In this model, biospheric, altruistic and egoistic values are presumed to influence environmental beliefs (operationalised using the NEP, a measure often used to assess general environmental attitudes), which in turn lead to awareness of consequences, or whether someone is aware of the negative or positive consequences of not behaving in a certain manner (Stern, 2000). Awareness of consequences in turn affects ascription of responsibility (the feeling of responsibility one has for that behaviour), which in turn leads to the activation of an individual's moral norm that directly affects behaviour (De Groot & Steg, 2009; Stern, 2000).

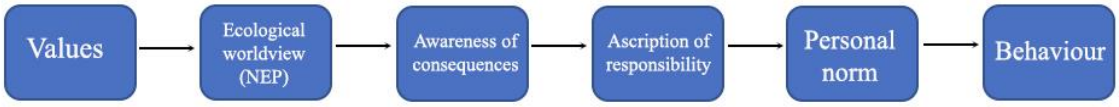


Figure 2. The value-belief-norm theory (adapted from Stern, 2000, p. 412)

This model has been shown to predict a range of pro-environmental behaviours and intentions to engage in pro-environmental behaviour (Steg & Vlek, 2009), including willingness to change behaviour (Stern et al., 1999), acceptability of energy policies (Steg, Dreijerink, & Abrahamse, 2005), acceptability of road pricing or intentions to reduce car use if such a policy were implemented (De Groot & Steg, 2008), intentions to choose green energy devices (Fornara, Pattitoni, Mura, & Strazzera, 2016). However, there is also conflicting evidence regarding the effectiveness of this model, with two meta-analyses suggesting that moral norms, in this model seen as direct predictors of behaviour, influence behaviour indirectly, by influencing intentions (Bamberg & Möser, 2007; Klöckner, 2013).

Similar to attitudes, this model does not account for the presence of obstacles and costs involved in pro-environmental behaviour. Furthermore, although conceptually, the framework suggests that these relationships are causal, the empirical studies supporting it are mainly correlational; as such, it is not clear how this framework can be employed in interventions to change behaviour. A related construct, the moral circle, or the set of entities that an individual feels morally obliged to show concern for (Bratanova et al., 2012) has been shown to influence pro-environmental tendencies, when manipulated experimentally. However, the research on this construct is limited, and the available research does not indicate how effective this manipulation is in the long term, nor what effects it would have on objectively measured behaviour.

2.2.5 Social norms

Social norms have also been explored in pro-environmental behaviour research. Social norms are defined as shared rules for behaving in a group, based on which individuals infer how it is (not) acceptable to behave (Elster, 1989). The literature refers to two different types of social norms. Descriptive norms refer to the perception of what most people do, while injunctive norms describe what most people approve of doing (Farrow, Grolleau, & Ibanez, 2017; Reno, Cialdini, & Kallgren, 1993).

The research on social norms has shown more diversity in the approaches taken. Correlational research has discussed injunctive norms in the context of the TPB, where subjective norms can be considered equivalent to injunctive norms (de Leeuw et al., 2015; Farrow et al., 2017).

However, meta-analyses indicate that subjective norms are typically the weakest predictor of intentions, compared to attitudes and perceived behavioural control (Armitage & Conner, 1999). Furthermore, in the environmental domain, a meta-analysis found that social norms determined behavioural intentions only indirectly, through attitudes, perceived behavioural control, and moral norms (Bamberg & Möser, 2007). Descriptive norms have also been explored in correlational research, with varied findings. Some studies suggest that descriptive norms are more strongly related to pro-environmental intentions or behaviour than injunctive norms (de Leeuw et al., 2015; Nigbur et al., 2010), whereas others found no evidence that descriptive norms significantly relate to pro-environmental behaviour or intentions (Fornara et al., 2016).

Social norms have also been used in experimental studies on interventions to influence pro-environmental behaviour, based on the assumption that, similar to values, norms do not guide behaviour unless they are activated situationally (Cialdini, Reno, & Kallgren, 1990). Several field experiments have shown that the manipulation of social norms using persuasive appeals can affect pro-environmental behaviour (Goldstein, Cialdini, & Griskevicius, 2008; Nolan et al., 2008; Schultz et al., 2007). Appeals based on descriptive norms have been found to be more effective than appeals based on environmental protection or self-interest (Goldstein et al. 2008; Nolan et al., 2008). However, Schultz et al. (2007) found that a descriptive normative message detailing average neighbourhood energy usage was only effective for individuals who consumed more than the average. For those individuals who were using low rates of energy, the appeal had the opposite effect of increasing energy usage. Furthermore, Momsen and Stoerk (2014) found that a descriptive social norms-based prompt shown to consumers making a choice between conventional and renewable energy was ineffective in promoting renewable energy choices, compared to a control.

This suggests that appeals based on social norms require careful consideration, as they can have positive, negative or no effects on behaviour, depending on the context in which they are utilised.

2.2.6 From motivation to behaviour

As highlighted in the previous section, the literature has explored various motives to engage in pro-environmental behaviour. The main implication of the motivation-based research reviewed above is that changing motivations should enhance pro-environmental behaviour, since these motivations predict behaviour (Steg & Vlek, 2009). However, considering the multitude of perspectives explored and the variation in findings on each perspective, it is unclear which perspective is most useful in which situation or how reliable these models are (Steg & Vlek, 2009). A further limitation of the motivational approaches is the reliance on correlational

research, which does not necessarily imply that the relationships identified are causal. As seen in the previous section, the number of experimental studies based on these motivations is less extensive, and has yielded complex, and sometimes mixed results regarding the ability of some of these factors to influence behaviour.

One key area that the literature has focused on is the attitude-behaviour gap, given the commonly found low correspondence between intentions and behaviour (Orbell, Hodgkins, & Sheeran, 1997). Sheeran's (2002) meta-analysis indicates that intentions generally only explain 28% of the variance in behaviour, and in the area of pro-environmental behaviour. Bamberg and Möser's meta-analysis (2007) yielded similar results. Although much of the literature has focused on the 'attitude-behaviour gap', or 'intention-behaviour gap', the 'value-action gap' has also been discussed in the literature, with reference to the fact that while people endorse pro-environmental values, they do not always act in accordance with them (Blake, 1999). Furthermore, other motivational factors such as social or moral norms have yielded similar findings.

Given the discrepancy between motivational factors and behaviour, the assumption that influencing motivations should lead to changes in pro-environmental behaviour, is problematic (Bamberg, 2013b). Furthermore, recent research from the European Commission (2017) indicates that 94% of respondents agreed that environmental protection is important to them personally, and 87% recognised that they can play a role in protecting the environment. This suggests that individuals are largely motivated to engage in pro-environmental behaviour and espouse positive attitudes overall. While motivation provides a reason for behaviour (Wilkie, 1990), behaviour does not solely depend on one's chronic motivation. Much of the correlational research reviewed in this section relies on individuals as rational decision makers that evaluate choices based on their values, attitudes or intentions. However, often individuals can be unconsciously influenced by situational variables (Verplanken & Holland, 2002). Research based on dual process mental models suggests that the brain uses two different types of processes in decision-making (Kahneman, 2011; Stanovich & West, 2000). The first process, System 1, works quickly, unconsciously and automatically to influence decisions, and is based on learned or innate associations. The second one, System 2, is consciously controllable and performs slow, effortful information processing, involving deliberation and analytic thinking (Osman, 2004; Slovic, Finucane, Peters, & MacGregor, 2004). Bargh and Chartrand (1999) similarly distinguish between automatic, non-conscious, environmentally-activated and conscious mental processes that individuals are aware of and intentionally perform. Automatic processes occur outside conscious awareness and can be activated by environmental features

such as situations, people, objects or places (Chartrand, 2005). Thus, in this view, both conscious and unconscious processes can influence behaviour. Consistent with this paradigm, some researchers have attempted to activate environmental values (Verplanken & Holland, 2002) or social norms (Goldstein et al. 2008; Schultz et al., 2007). However, in some studies, the activation of values is shown to affect some types of behaviour (charitable donations and self-reported voting behaviour; Verplanken & Holland, 2002), whereas in other studies it is shown not to significantly affect behaviour (energy saving – Nolan et al., 2008). Similarly, the use of appeals based on the activation of social norms has had varying degrees of success, with some finding significant positive effects on behaviours such as energy saving (Nolan et al., 2008), others failing to find an effect (Momsen & Stoerk, 2014) and others finding a negative effect, for those participants who were already saving energy to a high degree (Schultz et al., 2007). Although these findings suggest potential to influence pro-environmental behaviour, the results have been mixed and suggest that the use of these strategies requires careful consideration of the context in which the pro-environmental behaviour is to occur, and of the type of behaviour in question.

One particular aspect of behaviour that motivational approaches do not take into account pertains to the situational obstacles that individuals often face when attempting to engage in pro-environmental behaviour. Such obstacles have been shown to affect whether someone engages in pro-environmental behaviour or not (Steg & Vlek, 2009). Steg and Vlek (2009) argue that pro-environmental behaviour can often pose barriers related to convenience, costs, time, and others, that may interfere with the enactment of behaviour, regardless of one's motivation to engage in that behaviour. Considering the discrepancy between motivation and the enactment of pro-environmental behaviour, it may be more effective to address the transition from motivation to behaviour, given that environmental motivation appears to be already high within the population (European Commission, 2017). One construct that may provide insights into individuals' ability to act on their motivation and engage in pro-environmental behaviour is self-control.

2.3 Self-control

Self-control is argued to be highly important in human life, by supporting a variety of behaviours that enable individuals to live happier and healthier lives (de Ridder et al., 2012; Tangney et al., 2004). On the other hand, a lack of self-control is seen as connected to various personal and social problems such as obesity, impulsive buying, procrastination, alcohol abuse and others (de Ridder et al., 2012). As such, given its importance in human life, the literature on

self-control is extensive (Duckworth & Kern, 2011). Self-control has been conceptualised using different perspectives. The literature has used the terms self-control, self-regulation, self-discipline and willpower largely interchangeably to refer to this construct (Baumeister, 2002; Baumeister & Vohs, 2007; Duckworth & Seligman, 2005; Hagger, Wood, Stiff, & Chatzisarantis, 2010).

From a dual-systems perspective, self-control outcomes depend on impulsive, reflective and situational influences on behaviour (Hofmann, Friese, & Strack, 2009). This perspective relies on the idea that two different mental systems determine human behaviour (Kahneman, 2011; Stanovich & West, 2000). Although different terms have been used to describe these systems (e.g., System 1 and 2 – Kahneman, 2011; hot-cool – Metcalfe & Mischel, 1999; impulsive-reflective – Hofmann et al., 2009), they share the assumption that one system relies on quick, unconscious, automatic processes, based on learned or innate associations whereas the other one relies on effortful, deliberate, reflective processes that are consciously controllable (Osman, 2004; Slovic et al., 2004). As such, one system is responsible for unconscious, automatic, impulsive behaviour, and the other system is responsible for consciously controlled forms of behaviour, which one intends to perform but require more resources (Hofmann et al., 2009). In this view, self-control is an outcome of the interplay between these two systems (Metcalfe & Mischel, 1999; Hofmann et al., 2009). The impulsive system is thought to generate impulses (a strong urge to act that provides immediate gratification) automatically, unconsciously, and as a result of environmental stimuli (Hofmann et al., 2009). On the other hand, the reflective system engages in higher order mental operations that require more mental resources, makes deliberate judgments and evaluations, makes plans for goal-pursuit and is in charge with inhibiting or overriding pre-potent responses (e.g., impulses) (Hofmann et al., 2009). High self-control is associated with the reflective system that consciously guides goal-directed behaviour, whereas the impulsive system is associated with low self-control (Duckworth & Kern, 2011). In this conceptualisation, behaviour is an outcome of the interplay between impulsive, reflective (deliberate evaluations, goals, etc.) and situational and dispositional factors such as available mental resources (Hofmann et al., 2009). Self-control thus requires resisting impulses in the service of more deliberate evaluations and goals (Hofmann et al., 2009). For example, a behaviour such as snacking can be reflective, when it is guided by one's beliefs and is the result of a deliberate evaluation (e.g., attitudes) toward snacking in that situation. The reflective mode thus represents the traditional attitude-behaviour relation (Honkanen, Olsen, Verplanken, & Tuu, 2012). However, the same behaviour can be impulsive, when it conflicts with one's beliefs and attitudes (e.g., snacking leads to weight gain), and one fails to activate the reflective system in charge of self-control (Honkanen et al., 2012).

Self-regulation has also been conceptualised from a motivational perspective, where goals are assumed to determine people's behaviours, as the starting point of deliberate action and where self-control supports the pursuit of longer-term goals (Gollwitzer, 1996). Goals are defined as internal representations of desired outcomes (Austin et al., 1996), with the assumption that individuals continue striving towards these desired states until their experienced state is sufficiently close to the desired state (Gollwitzer & Moskowitz, 1996).

Carver and Scheier (2000) discuss self-regulation as a feedback loop, where goals serve as reference points, and individuals seek to reduce discrepancies between actual and desired states (goals) (Carver & Scheier, 2000). This feedback loop involves setting goals (reference points), and comparing these with one's evaluation of their current state; the outcome of this comparison is behaviour (Carver & Scheier, 2000). If the comparison shows no difference between goals and present states, this indicates that the goal has been fulfilled and no action is to be taken. However, in the case of a discrepancy between the current and desired state, then behaviour is to be adjusted to reduce this discrepancy (Carver & Scheier, 1990). Adjusting one's behaviour changes one's current state, starting the feedback loop again. The new current state is then compared to the reference point and so on, maintaining the feedback loop until the goal is achieved (Carver & Scheier, 2000). In this view, self-regulation involves three components: goal-setting, monitoring (keeping track of behaviour and its effects) for discrepancies between goals and current states, and implementing behaviour that is consistent with one's goals to reduce the behaviour-goal discrepancy (Carver & Scheier, 2000; de Ridder, Kroese, & Gillebaart, 2018; Mann, de Ridder, & Fujita, 2013; Nielsen, 2017).

Another motivational perspective conceptualises two elements involved in goal-directed behaviour: motivation and volition (Achtziger & Gollwitzer, 2010). The psychological processes governing these components differ. Motivation involves processes that motivate the selection of particular goals and the formation of goal intentions. In particular, attitudes and intentions are seen as reflective of motivation and, as such, indicate how hard one is prepared to try, or how much effort one will exert, in order to achieve desired outcomes (Ajzen, 1991; Gollwitzer, 1990). The second process is volitional, involving processes of translating these goals into action: the enactment and control of action directed at achieving one's goals (Achtziger & Gollwitzer, 2010; Gollwitzer & Moskowitz, 1996). Self-control operates at this stage, where obstacles and temptations may intervene, and is essential in supporting goal achievement and engagement in goal-directed behaviour (Nielsen, 2017).

The model of action phases, for instance, provides a more detailed outline for four stages involved in goal-directed behaviour, which correspond to motivation and volition (Achtziger &

Gollwitzer, 2010; Gollwitzer, 1990). The first phase is the pre-decisional phase, where one chooses the goals one wishes to pursue, after weighting alternatives based on attitudes, subjective norms, or perceived behavioural control (Achtziger & Gollwitzer, 2010). This stage is completed by the formation of intentions (Gollwitzer, 1990). The pre-actional phase involves initiating goal-directed actions and planning strategies for achieving the selected goal. The actional phase includes completing and enacting goal-directed actions, while the post-actional phase involves evaluating what was achieved compared to what was desired, and providing feedback to stop or continue goal pursuit (Achtziger & Gollwitzer, 2010). The pre-decisional and post-actional phase reflect motivation, while the pre-actional and actional phases reflect volition (i.e., goal striving) (Achtziger & Gollwitzer, 2010). Achieving goals and engaging in goal-directed actions involves successfully passing through all these stages. However, for many behaviours, following the pre-decisional phase, goals are deterred by obstacles and temptations that conflict with goal-directed behaviour. Self-control thus operates at this stage, and helps individuals act on their motivation (Gollwitzer, 1996).

However, the most common view in contemporary literature on self-control is that self-control broadly involves one's ability to overcome a conflict between opposing behavioural tendencies, one oriented towards achieving longer term goals, and the other oriented towards momentary temptations (Baumeister, Heatherton, & Tice, 1994; Duckworth, Gendler, & Gross, 2016; Duckworth & Kern, 2011; Fujita, 2011). Thus, self-control enables individuals to overcome undesired behavioural tendencies and to advance the pursuit of longer term goals (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Fishbach, Friedman, & Kruglanski, 2003; Fishbach & Shah, 2006; Fujita, 2011; Tangney et al., 2004). This view will be adopted in this thesis, as it reflects the two common themes across the various conceptualisations of self-control: self-control supports the achievement of longer-term goals (De Ridder et al., 2012; Nielsen, 2017), and is required to solve a conflict between two incompatible behavioural responses (Duckworth & Kern, 2011; Fujita, 2011).

In this view, obstacles, or temptations, are tendencies towards short-term, inherently attractive lower priority pursuits with immediate benefits, damaging to one's long-term pursuits (Fishbach & Zhang, 2008). In the presence of temptations, self-control conflicts or dilemmas appear, where individuals' higher-order goals, offering delayed benefits, but more difficult to enact, conflict with lower-order goals, offering immediate benefits and an easy behavioural alternative (Myrseth & Fishbach, 2009). A self-control conflict therefore represents an internal goal conflict between a more attractive alternative with proximate, but short-lasting benefits, and a

more difficult one (due to obstacles) with remote, but long-lasting benefits (Baumeister et al., 1998).

For instance, one might have the goal of losing weight. When buying a snack, one may be faced with a choice between a muffin or a piece of fruit. Although fruit is the lower calorie alternative, conducive to goal achievement, the muffin would be more enjoyable in the short-term and thus represents a temptation. To continue striving for the goal of losing weight, one would have to refrain from eating the tempting muffin, and instead choose the fruit. The conflict between these two incompatible behavioural responses can be solved in accordance with one's long-term objectives, reflecting successful self-control, or in accordance with short-term motives reflecting self-control failure (Duckworth, 2011). Good self-control is therefore required to successfully overcome obstacles that conflict with the achievement of long-term goals, and thus to act on one's motivations to achieve these long-term goals (Myrseth & Fishbach, 2009). Furthermore, Myrseth and Fishbach (2009) argue that to successfully pursue a goal in the face of temptation, an individual must first identify that they face a self-control conflict between a temptation and a higher-order goal. Only after this conflict is identified, individuals can engage in strategies to overcome temptation and pursue their goals. Self-control failure, in this view, can result from either a failure to identify this conflict, or a failure to exercise self-control if the conflict is identified (Myrseth & Fishbach, 2009).

The types of obstacles and temptations that can create self-control conflicts are varied. For instance, individuals may face feasibility constraints, such as lack of time or increased effort required to achieve specific goals, making lower-order behavioural alternatives more convenient (Trope & Fishbach, 2000). Other obstacles include the difficulty inherent in specific goal-directed behaviour (as in the muffin example above), negotiating between competing goals, where an individual has to choose which goal they want to fulfil, as well as automatic behavioural tendencies and habitual behaviours (Gollwitzer & Brandstätter, 1997; Gollwitzer & Moskowitz, 1996). Self-control thus enables individuals to regulate their behaviour according to their longer-term goals by overcoming the obstacles that prevent them from engaging in goal-directed behaviours (Baumeister et al., 1998).

2.4 Researching self-control

Given the importance of self-control in achieving desired outcomes, the research on self-control is extensive, with two main empirical perspectives on self-control. The first one is based on individual differences in people's self-control ability, where self-control is seen as a stable trait, or disposition (Tangney et al., 2004). Secondly, self-control has also been seen as a state,

defined as “the more transient level of self-control at a given moment” (de Ridder et al., 2018, p. 40). Much of the research has studied self-control as a state, inferring it on the basis of how individuals perform tasks demanding self-control (Ariely & Wertenbroch, 2002; Mischel, Shoda, & Rodriguez, 1989; Muraven & Baumeister, 2000). In this perspective, self-control can be manipulated situationally (de Ridder et al., 2018). This perspective has employed a variety of approaches that have attempted to manipulate individual self-control, measured via an individual’s performance in tasks that involve a conflict between opposing behavioural tendencies, one in favour of and one against a person’s longer-term objectives (Fujita, Trope, Liberman, & Levin-Sagi, 2006). Despite methodological differences, both perspectives (state and trait self-control) acknowledge the role of self-control in overcoming tendencies towards short-term gratification and in engaging in desirable behaviours to advance one’s goals (Duckworth & Kern, 2011; Imhoff, Schmidt, & Gerstenberg, 2014).

2.4.1 Trait self-control

The trait view of self-control is based on the assumption that individual differences exist in people’s ability to overcome short-term temptations in favour of long-term goals, which is seen as a stable trait, or disposition (Tangney et al., 2004). In this view, some individuals are better than others at regulating their behaviours towards the achievement of desired goals. Those with a lower capacity for self-control, in turn, are more prone to engage in behaviours that are satisfying in the short-term, but damaging to their long-term pursuits. A substantial amount of literature supports this view of self-control as a stable trait (Martinsson, Myrseth, & Wollbrant, 2012) which has typically been measured using psychometric scales. Tangney et al. (2004) provide evidence that self-control, conceptualised as the ability to control thoughts, emotions, impulses, and performance, and measured using a scale measure, is related to a series of important life outcomes and behaviours, including better academic performance, fewer impulse control problems, better psychological adjustment and better interpersonal relationships (Tangney et al., 2004). Research on delay of gratification or temporal discounting, has taken a similar, trait-based perspective to self-control. Self-control is seen as a stable disposition to choose larger, long-term rewards over immediate, smaller rewards (de Ridder et al., 2012; Duckworth & Kern, 2011; Mischel et al., 1989). This perspective typically employs tasks that involve decisions between smaller (less valuable), immediate rewards, and larger (more valuable), delayed rewards; the ability to choose the larger delayed rewards in the face of the temptation of a smaller reward immediately available is seen as indicative of self-control (Duckworth & Kern, 2011).

Research has investigated the processes by which trait self-control influences behaviour. Self-control is shown to facilitate both the inhibition of undesirable behaviour and the promotion of desirable behaviour (de Ridder et al., 2012). Trait self-control is thus related both to behaviours that need to be inhibited and to those that need to be initiated, with similar effect sizes *(*de Ridder et al., 2012). Furthermore, Ent, Baumeister and Tice (2015) also suggest that high trait self-control is also linked to avoiding temptation: people high in trait self-control reported engaging in behaviours that would minimise temptation to a greater extent than people low in trait self-control. This suggests that people with high self-control have also developed and routinely use strategies that enable them to be more successful at self-control (de Ridder et al., 2018). Similarly, other findings suggest that self-control is also linked to the formation of beneficial habits, or automatic tendencies developed through behavioural repetition (de Ridder et al., 2012; Galla & Duckworth, 2015). For instance, positive relationships between self-control and eating healthy snacks, exercising, and getting consistent sleep, homework completion, GPA, were found to be mediated by habits (Galla & Duckworth, 2015). Similarly, other studies found that the effects of trait self-control on behaviour are mediated by habits (Adriaanse, Kroese, Gillebaart, & De Ridder, 2014; Gillebaart & Adriaanse, 2017), and in their meta-analysis, de Ridder et al. (2012) found that self-control is related to both conscious and automatically performed behaviours.

Furthermore, another way by which trait self-control may support desirable behaviour is related to the magnitude of the self-control conflict experienced by individuals. Haynes, Kemps and Moffitt (2016) found that self-control leads to lower desire for tempting alternatives, which mediates the link between trait self-control and behaviour, further supporting the assumption of a weaker conflict in those with higher self-control. Other studies support the view that individuals higher in trait self-control experience lower desire for temptations and less conflict in relation to these temptations (Forestier et al., 2018; Gillebaart, Schneider, & De Ridder, 2016; Hofmann, Baumeister, Förster, & Vohs, 2012). These findings suggest that the mechanisms by which self-control operates also include automatic processes, and not only conscious or effortful behavioural processes (de Ridder et al., 2012).

Whilst the evidence indicates that trait self-control is linked to an impressive array of behaviours, and mechanisms that support beneficial behaviours, the evidence is limited to correlational studies that do not necessarily demonstrate causality. Furthermore, it appears that when behaviour is measured using self-reports, the relationship between self-control and behaviour is larger than when behaviour is directly observed (de Ridder et al., 2012). Similarly, self-control also has stronger relationships with hypothetical or imagined behaviours (de Ridder

et al., 2012). This suggests that while self-control is strongly related to what people say they do or would do, its relationship with observed behaviour is somewhat weaker, although still significant. As such, the effects of self-control may be less prominent in the real world, when a multitude of other factors affect behaviour (de Ridder et al., 2012).

2.4.2 State self-control

The second perspective regards self-control as a state that varies across situations and time (de Ridder et al., 2012). Several approaches have been used in researching self-control as a state, subject to situational influences.

One of the most prominent perspectives is the "resource" view of self-control, where self-control is regarded as a limited psychological resource that may become depleted if self-control is exerted (Baumeister et al., 1998; Baumeister, Vohs, & Tice, 2007). In this view, exerting self-control for a given action depletes one's capacity for self-control, leading to ego depletion. In a state of ego depletion, one is less likely to be able to exercise self-control in further actions that may require it (Imhoff et al., 2014). Self-control is thus seen as a resource that varies depending on one's previous attempts to exercise self-control (Baumeister et al., 1998). These resources can become depleted, when individuals exercise self-control, and can be replenished when individuals do not exert self-control (Baumeister et al., 1998). Research on ego depletion typically involves a dual-task paradigm, where participants have to exercise self-control in an initial task, which presumably uses up their self-control resources. This is followed by a second, unrelated self-control task, in which individuals are expected to fail to exercise self-control (Baumeister et al., 2007). This research is mainly focused on the inhibition of behavioural tendencies (Hagger et al., 2010). For example, when participants were asked to refrain from eating freshly baked cookies, they showed decreased persistence in a subsequent problem-solving task (Baumeister et al., 1998).

The ego depletion effect has been demonstrated in numerous studies on various domains of inhibition, such as aggression (DeWall, Baumeister, Stillman, & Gailliot, 2007), overeating unhealthy food (Vohs & Heatherton, 2000), physical endurance, emotion regulation, and performance in logical decision tasks (Baumeister et al., 2007). In a meta-analysis of 198 published studies on ego depletion, Hagger et al. (2010) found that the effects of ego-depletion were robust, with an overall medium to large effect size.

However, the ego depletion phenomenon has recently been subject to debate. The findings of a recent meta-analysis that included unpublished research on ego depletion (Carter & McCullough, 2014) and a set of replication studies of ego-depletion (Hagger et al., 2016) failed

to support the assumption that exerting self-control leads to poorer performance in subsequent self-control tasks. Further contradictory findings emerged in research on glucose, purported to be the main source of energy that fuels self-control (Gailliot et al., 2007). Empirical evidence suggests that exerting self-control leads to reduced glucose levels; in turn, restoring glucose levels through sugar consumption improved self-control performance after depletion (Gailliot et al., 2007). However, several papers and two meta-analyses failed to replicate these findings regarding the effect of self-control exertion on glucose levels and effect of sugar consumption on ego depletion (Dang, 2016; Job, Walton, Bernecker, & Dweck, 2013; Lange & Eggert, 2014; Lange, Seer, Rapior, Rose, & Eggert, 2014; Vadillo, Gold, & Osman, 2016).

Alternative explanations have also been proposed to explain the reduction in self-control following self-control exertion. It has been suggested that ego depletion in fact reflects a lack of motivation to achieve a task, related to the lack of value or incentive perceived as opposed to the effort required for the second task (Hagger et al., 2010). For instance, when individuals are offered incentives to increase motivation to engage in the second task, they perform well regardless of initial self-control exertion (Muraven & Slessareva, 2003). Another alternative explanation is fatigue; exerting self-control requires effort, which can lead to fatigue and in turn, decreased capacity to exert self-control in the future (Hagger et al., 2010). Perceptions of mental fatigue have been shown to affect individuals' persistence on self-control tasks following ego depletion, whereby participants who reported less mental fatigue showed better self-control performance following ego depletion (Clarkson, Otto, Hassey, & Hirt, 2016).

Recent findings have suggested that people's beliefs about the nature of willpower may affect the extent to which ego depletion occurs (Job, Dweck, & Walton, 2010). Job et al. (2010) argue that people hold different theories about their willpower: some individuals believe that willpower is limited and can easily become depleted (limited theory), while others believe that willpower is unlimited (non-limited theory). In this view, ego depletion occurs because people believe that their willpower is limited (Job et al., 2010). This is supported by several studies that show that individuals with a limited willpower theory (either measured as a trait, or experimentally manipulated) exhibited poorer self-control performance following initial self-control exertion, compared to individuals who believed willpower is not limited (Job, Bernecker, Miketta, & Friese, 2015; Job et al., 2010). Moreover, individuals who were primed with a non-limited willpower theory were not affected by ego depletion; however, in the absence of ego depletion, beliefs about willpower did not affect behaviour (Job et al., 2015, 2010). Chronic beliefs about willpower were also shown to be related to self-control outcomes outside the laboratory, such as study performance (GPA), consumption of unhealthy food,

procrastination, more efficient goal striving, but only under demanding circumstances (such as during final exams) (Bernecker & Job, 2015; Job, Walton, Bernecker, & Dweck, 2015).

As it can be seen, a growing number of studies provide evidence for alternative explanations or have failed the replicate the ego depletion effect. Although the majority of research on state self-control has focused on ego depletion, other approaches have been utilised in the literature to manipulate self-control situationally (de Ridder et al., 2018).

One approach has been manipulating individual perceptions of own self-control through the recall of past self-control experiences (Ein-Gar, 2015; Ein-Gar & Steinhart, 2017). This is based on the assumption that individuals often infer their own ability to resist temptations from their past actions, which may in turn affect their subsequent actions (Battaglini, Bénabou, & Tirole, 2005). Research has shown that people use past behaviours to guide current behaviours, and that they tend to behave consistently with past behaviours of which they have been made aware (Albarracín & Wyer, 2000).

Research on self-control indicates that being able to resist temptation signals to consumers their ability to resist temptation, whereas succumbing to temptation signals to consumers that they have weak willpower (Dhar & Wertenbroch, 2012). Several studies indicate that recalling past self-control experiences influences performance in self-control tasks. Nikolova, Lamberton, & Haws (2015) found that when participants recalled two instances when they exercised self-control, they behaved in accordance with the content of the recall. For instance, participants who recalled having resisted spending temptations indicated lower willingess to incur financial debt than those who recalled having succumbed to spending temptations (Nikolova et al., 2015). Furthermore, the authors argue that recalling past self-control experiences operated by affecting individuals' perceptions regarding their self-control abilities. When recalling past successes is easy (i.e., participants only have to recall two instances of self-control), participants relied on the content of recall to draw judgments about their self-control. This led to increased perceptions of high or low self-control, which in turn led to subsequent choices in accordance with these perceptions (Nikolova et al., 2015). This is consistent with past research on self-evaluation indicating that individual self-evaluations reflected the recalled content when recall was easy (Schwarz et al., 1991).

Mukhopadhyay, Sengupta and Ramanathan (2008) also found that remembering resisting or succumbing to food temptations affected individuals' self-control decisions similarly, particularly when participants were encouraged to think of the reasons for their prior behavior. Similarly, Ein-Gar (2015) manipulated self-control perceptions; in this study, recalling successful self-control experiences led participants to commit to more hours volunteering in a

children's care centre in the following months, compared to those who recalled self-control failures.

Another process by which recalling past self-control can influence self-control is by increasing the accessibility of mental constructs associated with self-control, or the salience of thoughts related to self-control (vanDellen & Hoyle, 2010). Greater accessibility of self-control constructs is shown to lead to behaviours consistent with those constructs (Fishbach et al., 2003; Fishbach & Shah, 2006). When self-control constructs are activated, consistent behaviour can occur automatically, outside conscious intention and independently of available mental resources (Fishbach et al., 2003).

The manipulation of construal levels has also been shown to affect individual self-control (Fujita et al., 2006). According to construal level theory, the same event or object can be mentally represented at multiple levels (Trope & Liberman, 2003). At high construal levels, individuals focus more on the abstract, goal-relevant features of a behaviour or object, and tend to exclude irrelevant features of those objects and events (Fujita et al., 2006). At low construal levels, individuals focus on the specific and concrete, but more peripheral, incidental features of a behaviour or object (Fujita et al., 2006). For example, the act of recycling a plastic bottle can be thought of in concrete terms – as an inconvenient action that requires one to carry a plastic bottle until a recycling bin is encountered, or more abstractly – as an action that helps protect the environment. Self-control outcomes can be influenced by manipulating the tendency to construe situations at a high level, which typically involves asking individuals to reflect on the overarching reasons why they want to achieve a goal, whereas lower level construals are activated by asking individuals to think in concrete terms about the actions they take to achieve a goal (Fujita et al., 2006). The evidence indicates that higher level construals lead to decreased preferences for immediate over delayed outcomes, greater physical endurance, stronger intentions to exert self-control, and less positive evaluations of temptations (Fujita et al., 2006). Fujita and Han (2009) found that higher-level construals lead to increased associations of temptations with negativity, which in turn promote self-control in decisions between healthy and unhealthy alternatives.

Finally, as highlighted in the ego depletion section above, manipulating individuals' theories about willpower can also affect situational self-control (Job, Bernecker, et al., 2015; Job et al., 2010; Mukhopadhyay & Johar, 2005). The manipulation typically involves priming individuals by asking them to complete a biased questionnaire (Job et al., 2010), or reading biased information about the nature of willpower (Mukhopadhyay and Johar, 2005). However, this particular manipulation appears to affect behaviour only under high self-regulatory demands, or

under ego depletion; in the absence of ego depletion, beliefs about willpower did not affect behaviour (Job, Bernecker, et al., 2015; Job et al., 2010; Miller et al., 2012). Furthermore, Mukhopadhyay and Johar (2005) found that those primed with limited beliefs about willpower were less successful at completing their goals that those primed with unlimited beliefs, only if they were low in self-efficacy (beliefs about one's ability to perform desired actions). The evidence on the role of beliefs about willpower is thus less extensive and primarily suggests that these are effective mainly under demanding circumstances, or under low self-efficacy.

2.4.3 State and trait self-control

Although the two perspectives are distinct, one of the underlying assumptions is that an individual's self-control processes involve both trait and resource aspects (Baumeister, 2014). However, this assumption has not been extensively assessed by empirical research, with the limited available evidence being mixed (Imhoff et al., 2014).

Most of the research on the interplay between the two has focused on ego-depletion, based on the assumption that while individuals are susceptible to ego-depletion, they also differ in their overall self-control ability (Hagger et al., 2010). As such, individuals with higher trait self-control are presumed to have more self-control resources available than those with lower trait self-control, and thus will have more self-control resources remaining, after engaging in a self-control task (Baumeister, Gailliot, DeWall, & Oaten, 2006; Hagger et al., 2010). This should lead to an interaction between trait and state self-control (Hagger et al., 2010). However, the empirical tests of this assumption have yielded inconsistent results. Some studies have found an interaction effect (DeWall et al., 2007; Gailliot et al., 2007), and others have found no interaction (Gailliot & Baumeister, 2007; Stillman, Tice, Fincham, & Lambert, 2009). Imhoff et al. (2014) found results opposite to this prediction: those high in trait self-control exhibited greater depletion than those with low trait self-control. Imhoff et al. (2014) explain these findings by utilizing Hofmann et al.'s (2012) view that people high in trait self-control tend to avoid tempting situations, and thus have less experience resisting temptations. Furthermore, it is not clear how to interpret these findings considering the current debates about the effects of ego depletion. In a different approach, Forestier et al. (2018) utilise a scale measure of state self-control, measuring individuals' perceptions of the mental resources or energy available to the self. They demonstrate that trait self-control predicts unhealthy and healthy behaviours, when controlling for state self-control.

Despite situational fluctuations in self-control resources, trait self-control appears to have a stable relationship with a wide range of positive behavioural outcomes (Tangney et al., 2004), and stable associations with desirable consumer decisions related to spending and eating (Haws,

Davis, & Dholakia, 2016). Although trait self-control can help understand existing, stable associations between different behaviours and self-control, a key limitation of this perspective is the correlational design required, which does not demonstrate causality. Therefore, this thesis will focus on both trait and state self-control, which can help identify both chronic associations and causal influences on behaviour. Considering the debate surrounding the ego depletion effect, the studies in this thesis will not focus on the resource view of self-control, but rather on the situational manipulation of self-control via the recall of past self-control successes or failures, which has consistently been shown to affect self-control in a variety of decisions.

2.5 Self-control in everyday behaviours

Extensive research documents the beneficial effects of high trait self-control on behaviour, whereas low self-control is linked to issues such as obesity, substance abuse, impulsive buying and procrastination (Baumeister & Heatherton, 1996; Vohs & Faber, 2007; Vohs & Heatherton, 2000). Conversely, high self-control is related to a range of important outcomes such as better academic performance and attendance, limited time spent procrastinating, fewer impulse control problems (excessive drinking and overeating), better psychological adjustment and mental health, better ability to cope with problems, better interpersonal relationships, better social competence, and more socially appropriate behaviour (de Ridder et al., 2012; Gailliot et al., 2007**;** Tangney et al., 2004). Delay of gratification research has yielded convergent findings to research measuring self-reported self-control. For instance, performance in a delay task in early childhood (1 marshmallow now vs. 2 marshmallows later) was found to predict academic performance, social competence and better coping with stress in later life (Mischel et al., 1989). Duckworth and Seligman (2005) found that performance in a delay of gratification task predicted final grades, school attendance, hours spent doing homework, and hours spent watching television, in two samples of students.

Trait self-control is also relevant to a range of consumer behaviours. High self-control is associated with less impulsive consumption, better money management, and less consumer indebtedness (Haws, Bearden, & Nenkov, 2012; Loewenstein, 1996). Haws et al. (2016) found that higher self-control is linked to healthier snack choices, more financial savings, better credit scores, and reduced likelihood to engage in impulsive purchases, whereas Wang et al. (2015) found that lower self-control leads to increased impulsive eating. Self-control was also found to influence the consumption of virtue products, or products whose usage can be time-consuming and costly, but that have distant future benefits, such as sunscreen or dental floss (Ein-Gar, Goldenberg, & Sagiv, 2012). A recent meta-analysis (de Ridder et al., 2012) found significant small to medium positive effects of self-control on behavioural domains such as school and

work, eating and dieting, interpersonal relationships, well-being and adjustment. State self-control has also been researched in relation to different types of behaviours, with decreased state self-control being shown to lead to increased spending, willingness to incur debts, procrastination, eating unhealthy food, and alcohol consumption (Mukhopadhyay et al., 2008; Muraven, Collins, Shiffman, & Paty, 2005; Nikolova et al., 2015; Vohs & Faber, 2007).

The literature has also explored the role of self-control in prosocial behaviour, defined as behaviour that is beneficial to other individuals, such as helping or cooperating with others (Aronson, Wilson, & Akert, 2007). Prosocial behaviour typically involves a conflict between an individual's self-interest and the welfare of others. In order to act on one's prosocial motivations, one must first overcome pro-self tendencies (Osgood & Muraven, 2015). Therefore, prosocial behaviour entails a self-control conflict between the temptation to act selfishly and one's prosocial tendencies, suggesting that one's prosocial behaviour is dependent on self-control ability (Martinsson et al., 2012). Several studies support this assumption. Kocher, Martinsson, Myrseth and Wollbrant (2016) and Martinsson, Myrseth and Wollbrant (2014) found positive correlations between self-control and cooperation in public goods games, whereas Martinsson et al. (2012) found that trait self-control positively correlates with donations to the Red Cross. Importantly, however, self-control was associated with cooperation only if individuals were able to identify a self-control conflict (Kocher et al., 2016). For those participants who had not identified a conflict, the correlation was not significant. The results were consistent when self-control conflict identification was experimentally manipulated (Martinsson et al., 2012, 2014). When self-control conflict identification was facilitated, the correlation was significant. However, in the condition in which there was a low likelihood of conflict identification, there was no correlation between self-control and prosocial behaviour (Martinsson et al., 2012, 2014).

Ein-Gar (2015) also finds that self-control as a trait, and as a state, influences commitment to prosocial behaviours, such as helping others. When self-control perceptions were manipulated experimentally, participants whose self-control perceptions were increased committed more hours of their time to a charitable cause. Although the findings in this stream of the literature are subject to debate, research employing the ego-depletion paradigm also suggests a link between self-control and prosocial behaviour. Findings indicated that depleted participants were less willing to help in hypothetical scenarios (Dewall et al., 2008) or to cooperate in public goods games (Osgood & Muraven, 2015), suggesting that ego-depleted participants are unable to inhibit pro-self tendencies in order to act pro-socially.

This set of findings thus suggests that self-control is highly relevant to a varied range of human

behaviours.

2.6 Self-control and motivation

It is assumed that self-control enables individuals to overcome obstacles in the way of achieving their goals (Baumeister et al., 1998). Self-control is thus presumed to support individuals in acting on their individual motivations to engage in a behaviour, and as such should determine the extent to which individuals act on their motivations (Hagger, 2013). Therefore, high self-control should lead to stronger associations between measures of motivation (such as attitudes and intentions) and behaviour. Conversely, when individuals have lower levels of self-control, the link between motivation and behaviour should be weaker. However, despite these theoretical links between self-control and motivation, in influencing behaviour, the literature has so far yielded inconclusive results on how the two constructs interact to influence behaviour.

Much of the self-control research addresses the links between self-control and behaviour, without exploring the issue of motivation. Trait self-control has been found to be correlated negatively with a range of behaviours and outcomes considered undesirable, such as incurring debts (Achtziger, Hubert, Kenning, Raab, & Reisch, 2015), consumption of unhealthy foods (Giese et al., 2015), Body Mass Index (Giese et al., 2015; Kinnunen, Suihko, Hankonen, Absetz, & Jallinoja, 2012; Price, Higgs, & Lee, 2017), Facebook procrastination (Meier, Reinecke, & Meltzer, 2016), fast food consumption (Hankonen, Kinnunen, Absetz, & Jallinoja, 2014), number of cigarettes smoked and glasses of wine drank (de Ridder, de Boer, Lugtig, Bakker, & van Hooft, 2011) , cyberloafing at work (Zhang, Zhao, Liu, Xu, & Lu, 2015), saturated fat intake and sedentary behaviour (Wills, Isasi, Mendoza, & Ainette, 2007), and alcohol use (Boals, vanDellen, & Banks, 2011; Tangney et al., 2004). Trait self-control has also been found to be positively correlated with behaviours and outcomes considered as desirable: students' GPA (Galla & Duckworth, 2015; Stadler, Aust, Becker, Niepel, & Greiff, 2016; Tangney et al., 2004), eating healthy snacks, exercising, getting consistent sleep, homework completion (Galla & Duckworth, 2015), hours of study (de Ridder et al., 2011), healthy eating (Forestier et al., 2018), fruit and vegetable consumption (Hankonen et al. 2014; Wills et al,. 2007), self-reported physical activity, and objectively measured aerobic and muscle fitness (Kinnunen et al. 2012), participation in sports (Wills et al., 2007), physical health (Boals et al., 2011), improvements in diet quality over time (Keller, Hartmann, & Siegrist, 2016). However, none of these studies take into account the participants' motivation to avoid undesirable and pursue desirable behaviours. De Ridder et al.'s (2012) meta-analysis of 102 studies on self-control also reveals a consistent direct relationship between self-control and various behavioural

domains: school performance, eating, addictive behaviour, prosocial behaviour, and deviant behaviour without any indicators of motivation.

Much of the research relies on the assumption that certain behaviours are generally desired (e.g., school and work performance, healthy eating, dieting, etc.) and some behaviours are generally undesired (e.g., cheating, driving above speed limits, addictive behaviours such as smoking and drinking, etc.) (de Ridder et al., 2012). For instance, de Ridder et al. (2011) argue that exercise and study hours in a student population are suitable outcome measures based on the assumption that students would generally hold personal goals related to high grades and good physical condition. Similarly, smoking and alcohol consumption are seen as generally undesirable behaviours with negative consequences. It is assumed that individuals would be likely to have goals or intentions to restrict those behaviours (de Ridder et al., 2011). However, not all individuals may be equally motivated to engage in or avoid these behaviours. For example, a student committed to performing well on final exams may experience a conflict between studying and attending a party before the exams. However, a student who is not concerned about their grade would not experience the same conflict (Fujita et al., 2006).

A smaller number of studies address the motivational element of behaviour in relation to trait self-control. Some researchers purposefully selected samples of motivated individuals, such as dieters (Keller & Hartmann, 2016; Crescioni et al., 2011). For instance, Crescioni et al. (2011) explored a sample of individuals aiming to lose weight, enrolled in a 12-week weight-loss programme. In this motivated sample, at the end of the programme, participants higher in self-control lost more weight and ate fewer calories than those lower in self-control. Other researchers acknowledge the role of motivational components as independent predictors of behaviour, alongside with self-control. Haynes et al. (2016) included motivation as a covariate in regression to control for the strength of motivation to eat healthily in an examination of the relationship between self-control and unhealthy snack consumption. They argue that the strength of this motivation may affect the extent to which the consumption of unhealthy snack food constitutes a self-control dilemma. Similarly, Gerrits et al. (2010) explored the role of self-control and diet concerns as predictors of consumption of fatty foods, finding them to be independent predictors of consumption of fatty foods. They argue that, to successfully fulfil one's goals, both motivation and self-control are required and operate independently (Gerrits et al., 2010). Sproesser, Strohbach, Schupp and Renner (2011) also found that motivation for controlling body weight and self-control independently predict a healthy diet, further supporting this assumption. Therefore, this set of findings suggests that to successfully fulfil one's goals,

both motivation and self-control are required, and that they operate independently (Gerrits et al., 2010).

A limited number of studies has also explored the moderating role of self-control in the relationship between motivation and behaviour, based on the idea that people who have better abilities to exert self-control over their behaviour should be more likely to act on their attitudes or intentions (Hagger et al., 2010). Intentions or attitudes would be expected to be more closely related to behaviour for those high in self-control than for those low in self-control. However, the findings regarding the moderating role of self-control have been mixed. Sproesser et al. (2011) found that general self-control and the motivation for body weight control significantly predicted healthy dietary behaviour together, but they found no evidence of an interaction between self-control and motivation. Similarly, Tomasone, Meikle and Bray (2015) found that intention and trait self-control were both significant predictors of fruit and vegetable consumption, but the interaction between intentions and trait self-control was not significant. In this case, intentions were not more strongly associated with behaviour for those individuals who were high in self-control, than for those who were low in self-control. However, Honkanen et al. (2012) found a significant interaction between self-control and attitudes, and Bertrams (2012) found a significant interaction between minimal grade goals and self-control capacity. In these cases, at high levels of self-control, the relationship between motivation and behaviour was significantly stronger than at low levels of self-control. These findings are also supported by experimental research on self-control. For instance, only participants who held relevant goals exhibited automatic processes related to self-control, such as the activation of higher order goals in the presence of temptation cues (Fishbach et al., 2003) or tendencies to automatically approach goals and avoid temptations (Fishbach & Shah, 2006).

Given this set of mixed findings, it is unclear what exactly is the relationship between motivation, self-control, and behaviour. Despite the lack of clarity regarding the role of motivation, self-control has consistently been found to influence behaviour across behavioural domains (de Ridder et al., 2012).

2.7 Pro-environmental behaviour and self-control

As highlighted throughout this literature review, a key focus of pro-environmental behaviour research has been motivation to engage in pro-environmental behaviour, such as environmental attitudes, values, affect, or social norms (Steg & Vlek, 2009). In fact, the majority of theories and models in environmental psychology focus on the issue of motivation (Lindenberg & Steg, 2007). However, research also indicates that while people generally exhibit pro-environmental

motivations, such as attitudes or intentions, their behaviours do not reflect these attitudes and intentions, leading to an intention-behaviour gap (Carrington et al., 2014). Although people generally appear to be motivated to engage in pro-environmental behaviour, other research highlights the many obstacles that pro-environmental behaviour entails, which may create a self-control conflict.

Being environmentally-friendly often requires individuals to sacrifice (Peattie & Crane, 2005). Pro-environmental behaviours involve considerable additional time, difficulty, and inconvenience, compared to unsustainable alternatives (Budeanu, 2007; Gleim et al., 2013; Peattie & Crane, 2005). Individuals tend to see public transport as more time consuming and more uncomfortable than the unsustainable alternative of driving (Salonen & Åhlberg, 2013). Furthermore, individuals tend to find using public transport to be 'depressing' and 'boring' (Gatersleben & Uzzell, 2007). Other sustainable alternatives, such as walking and cycling are also seen as more inconvenient and more difficult than driving, and are perceived to involve more physical effort than driving and public transport (Gatesleben & Uzzell, 2007). This physical effort may deter individuals from behaviours such as cycling; for instance, hilliness was shown to negatively influence individuals' propensity to cycle, and had the largest influence out of a set of factors influencing commuter cycling, including traffic density, temperature, distance, rain or the existence of cycling lanes (Grudgings et al., 2018).

Similarly, recycling is seen as a difficult behaviour, requiring significant effort and time, in order to sort the waste and throw items in separate bins, let alone find adequate recycling bins (Lindsay & Strathman, 1997; Tonglet, Phillips, & Read, 2004). Furthermore, distance from recycling facilities can also prevent individuals from recycling (Garcés, Lafuente, Pedraja, & Rivera, 2002). Environmentally-friendly consumption also involves issues related to convenience. Buying a conventional product is more convenient than the pro-environmental alternative, which would require a consumer to expend additional time to gather information about environmentally-friendly products and to source these products, which are not as widely available (Papista & Krystallis, 2013; Thøgersen, 2005).

Another barrier to pro-environmental behaviour is the additional financial costs associated with green technologies and sustainable products (Axon, 2017). In the area of energy use, Hobman and Frederiks (2014) found that consumers do not choose green energy suppliers due to the increased cost, demonstrating a clear conflict between additional costs and pro-environmental alternatives. Similarly, higher prices can deter consumers from purchasing sustainable product alternatives (Gleim & Lawson, 2014; Gleim et al., 2013; Magnusson, Arvola, Hursti, Åberg, & Sjödén, 2003). For example, participants reported that one of their main reasons for not

choosing environmentally-friendly products such as energy efficient light bulbs, or eco-friendly dog food, paper towels or cleaning products was the higher price of these items (Gleim & Lawson, 2014). Similarly, other research focused on green vehicles indicates that the higher cost is also an important barrier in the case of purchasing green vehicles (Rezvani, Jansson, & Bodin, 2015).

Negotiating between competing goals is an important aspect in pro-environmental behaviour, as being environmentally-friendly may mean sacrificing other important goals that the individuals may have. Often, behaviour is an outcome of multiple goals that may not always be compatible (Lindenberg & Steg, 2007). For instance, the desire to provide in abundance for one's family (Graham-Rowe, Jessop, & Sparks, 2014) and maintain social norms by having an appealing garden (Kurz, Donaghue, Rapley, & Walker, 2005) are shown to conflict with reducing waste and water usage, respectively. Similarly, the desire for reliable transportation conflicts with hybrid/electric vehicle usage, perceived as problematic due to the need for frequent refuelling in the context of a deficient battery charging infrastructure (Egbue & Long, 2012). Steg, Bolderdijk, Keizer and Perlaviciute (2014) and Lindenberg and Steg (2007) also recognise a goal conflict between normative goals (related to acting in the appropriate way, such as protecting the environment) and goals that lead to pleasure or personal gains. For instance, individuals may face conflicts between pro-environmental actions, which would benefit the environment, and self-interested goals, such as saving money or time (Chuang, Xie, & Liu, 2016). This conflict has also been conceptualised in terms of a social dilemma, or a situation where members of a group experience a conflict between maximising self-interest or the interests of the wider group (van Dijk, De Cremer, & Handgraaf, 2004). Unsustainable behaviours often involve pursuing one's personal interests whilst pro-environmental behaviours often involve trading off self-interest to benefit the environment (Joireman, 2005).

This goal conflict is similar to the conflict between one's self-interest and the interests of others, embedded in prosocial behaviour more generally. Findings from the self-control literature suggest that trait self-control has a positive relationship with prosocial behaviour (Martinsson et al., 2012). This effect was demonstrated not only in the trait self-control literature (Martinsson et al., 2012; Martinsson et al., 2014), but also experimentally in the ego-depletion literature (Dewall et al., 2008). It has been argued that pro-environmental behaviour can be considered a special type of prosocial behaviour; whilst it carries the implication that environmental actions would benefit others in the long term, it is often the case that few direct individual benefits are gained from pro-environmental behaviour (de Groot & Steg, 2009). Furthermore, while pro-environmental behaviour can overlap with pro-social behaviour (e.g., preventing air pollution),

the two can also conflict, for instance when pro-environmental action requires sacrificing human interests (e.g., carbon emissions taxation; Bratanova et al., 2012). Nonetheless, self-control has been shown to influence prosocial behaviours related to cooperation and therefore may also be relevant to addressing the conflict between pro-environment – pro-self interests inherent to pro-environmental behaviour.

Another obstacle to enacting pro-environmental behaviour is the habitual nature of unsustainable behaviours (Gifford, 2011). Many unsustainable behaviours are habitual and often performed every day, such as waste disposal and shopping (Bamberg, 2002). Habits are behavioural patterns that have been reinforced through repetition and have become automatic responses performed relatively effortlessly and without conscious control (Verplanken & Holland, 2002). Habits, therefore, may be triggered automatically when a situation is encountered (Aarts, Verplanken, & Knippenberg, 1998). Non-habitual responses are more effortful and require one to utilise self-control to inhibit habitual, automatic responses (Aarts & Dijksterhuis, 2000). Establishing new, environmentally-friendly behaviours requires one to overcome unsustainable habitual responses, and to persist in enacting the new behaviour over time to form new desirable habits (Kollmuss & Agyeman, 2002). Self-control has been demonstrated to support processes related to breaking bad habits and forming new, positive habits (de Ridder et al., 2012).

As it can be seen from the literature, in the attempt to perform environmentally-friendly behaviours, individuals are very likely to encounter obstacles, stemming from habitual behavioural tendencies, conflict between competing goals, or the constraints and difficulties inherent in pro-environmental behaviour. These obstacles, clearly identified in the literature, create a self-control conflict between the desired, green behaviour and easier, non-green behavioural alternatives. Supporting the self-control conflict involved in pro-environmental behaviour, Farelly and Tucker's (2014, p. 22) respondents use self-control notions to label choices conflicting with their green goals: "*There is a big temptation to simply throw all the hard plastic into the recycling*". Johnstone and Tan's (2015, p. 8) participants similarly observe that being green requires self-control and self-discipline: "*I'm far too self-indulgent… I'd like to be (green) but I really don't have the moral discipline*." Axon's (2017, p. 17) findings emphasise the appeal of convenience in contrast with sustainable living: "*The pressure is on to keep a home, a job, and all of these things around sustainable lifestyles, it raises questions about whether you can pack it all in 24 hours. The answer is probably no, so we'll go for convenience*." Hoek, Pearson, James, Lawrence and Friel (2017) also reported that participants in their study were able to identify that temptations in the supermarket typically interfere with

reducing food waste and eating more sustainably. Additionally, research has also found that conscientiousness, a personality trait that involves high levels of self-discipline (Brick & Lewis, 2016), which is theoretically related to the propensity for self-control (Tangney et al., 2004), has also been found to correlate with pro-environmental behaviour (Brick & Lewis, 2016; Busic-Sontic, Czap, & Fuerst, 2017), suggesting further links between self-control and pro-environmental behaviour.

A limited number of studies acknowledges the role of volitional factors in behaviour. Nielsen (2017) reviews the role of self-regulation in pro-environmental behaviours and discusses potential implications with regards to enhancing pro-environmental behaviour. Although Nielsen (2017) provides a comprehensive review of how self-regulation can affect behaviour, no empirical research is conducted in this paper. Bamberg (2013b, 2013a) conceptualises a model of behaviour change based on the model of action phases (Gollwitzer, 1990) which involves several stages, from goal setting and the development of motivation, to goal striving and behaviour. Although the self-control literature demonstrates that individuals differ in their ability to exercise self-control and engage in goal-directed actions, Bamberg's model does not address individuals' ability to engage in self-regulation processes, nor the role that one's self-control ability plays in pro-environmental behaviour. Chuang et al. (2016) explore the role of ego-depletion as a mediator in the relationship between self-construal and pro-environmental behaviour. However, this paper focuses only on the resource view of self-control, which has recently been subject to debate, and does not address its direct relationship with pro-environmental behaviour. As it can be seen, the role of self-control as one's ability to overcome conflicts between goals and temptations has been largely understudied in the pro-environmental behaviour literature.

2.8 The current research

Much of the research on pro-environmental behaviour assumes motivational factors directly predict behaviour. In particular, the literature has focused on the role of intentions or environmental attitudes, typically seen as reflective of motivation to achieve desired outcomes (Ajzen, 1991; Gollwitzer, 1990).

However, as discussed above, the numerous challenges in enacting pro-environmental behaviour suggest that self-control may be involved in environmentally-friendly behaviour. Self-control theory suggests that behaviour requires both motivation, and the self-control necessary to overcome obstacles in the way of goal achievement (Mann et al., 2013). As individuals face temptations to engage in unsustainable behaviour, self-control is needed to

overcome these temptations. Importantly, an extensive self-control literature demonstrates that some people are better than others at their ability to exercise self-control, which suggests individual variation in self-control could be important for the study of pro-environmental behaviour. Despite this, research on the role of self-control in pro-environmental behaviour remains very limited, as none of the studies reviewed above explored the direct link between self-control and pro-environmental behaviour, nor whether pro-environmental behaviour can be influenced by manipulating self-control. This leaves ample scope for exploring the role of self-control in individuals' engagement in pro-environmental behaviour.

One of the aims of this thesis is thus to address this gap and to understand whether self-control is linked to pro-environmental behaviour. Furthermore, the consideration of self-control in pro-environmental behaviour has important practical implications for developing interventions to promote pro-environmental behaviour. In particular, self-control strategies provide a theoretical basis for the development of interventions that can support pro-environmental behaviour. If self-control is involved in pro-environmental behaviour, then interventions to enhance individual self-control may be useful in enhancing pro-environmental behaviour. Therefore, a second aim of the thesis is to explore the practical implications of this relationship for promoting pro-environmental behaviour.

The next chapters will address these aims. Chapter 3 will explore the empirical relationship between self-control and pro-environmental behaviour. A key implication of this relationship is that by enhancing individual self-control by using self-control strategies, engagement in pro-environmental behaviour can also be enhanced.

Chapter 4 builds on the findings from Chapter 3 and theoretically addresses the implications of this link for interventions to promote pro-environmental behaviour. Chapter 5 explores these implications practically, by testing a marketing intervention based on a self-control strategy for promoting pro-environmental behaviour.

Chapter 3: Self-control and pro-environmental behaviour – empirical studies

3.1 Introduction

As highlighted in the previous chapter, one of the aspects overlooked in the pro-environmental behaviour literature pertains to the self-control required to engage in pro-environmental behaviour. Much of the research on pro-environmental behaviour has explored motivations for pro-environmental behaviour, assuming that motivational factors directly lead to behaviour (Nielsen, 2017). However, the literature suggests that self-control is needed for individuals to be able to act on their motivations, and therefore to translate motivations into behaviour. Self-control is the psychological mechanism that enables people to engage in goal-directed behaviour, by overcoming obstacles and temptations in the way of such behaviour (Fishbach & Trope, 2005). Self-control helps support desirable behaviours and suppress undesirable behaviour, with benefits for a large range of behaviours (de Ridder et al., 2012). Extensive literature demonstrates that some people are better than others at their ability to exercise self-control, which directly affects their ability to engage in a range of desired actions. As pro-environmental behaviours tend to involve more effort, difficulty, and costs than unsustainable behavioural alternatives (Steg & Vlek, 2009), self-control may be necessary to overcome these obstacles to pro-environmental behaviour.

Despite the potential link between self-control and pro-environmental behaviour, research on the role of self-control in pro-environmental behaviour is limited, leaving a gap in the empirical examination of the role of self-control in individuals' engagement in pro-environmental behaviour.

The current set of six studies aims to address this gap, and will explore the relationship between self-control and pro-environmental behaviour. As it has been highlighted in the previous chapter, self-control has been researched from the trait perspective, where it is seen as a stable disposition, as well as from a state perspective, where is seen as a state that can vary across situations and time (de Ridder et al., 2018). This research will adopt a comprehensive approach including both perspectives on self-control. While research on trait self-control can reveal longer-term implications of the link between chronic levels of self-control and pro-environmental behaviour, due to the correlational nature of the research, it does not allow the determination of causality. As such, the current research will also manipulate high or low state self-control, to determine whether the role of self-control on pro-environmental behaviour is causal.

The first three studies will explore trait self-control, and will measure it using an established scale measure, to explore the correlational relationship between self-control and pro-environmental behaviour. The final three studies will experimentally manipulate state self-control to understand its causal effects on pro-environmental behaviour tendencies.

Furthermore, self-control is believed to operate in relation to individual goals and motivation (de Ridder et al., 2012). However, there is little consensus in the literature regarding how self-control influences behaviour in conjunction with motivation. It is argued that self-control influences the achievement of positive outcomes, such as better health, wellbeing and success in life, by supporting 'desirable behaviours', or behaviours that enable individuals to achieve a better fit between the self, and their surrounding environment (Tangney et al., 2004). The majority of literature on self-control is thus based on the assumption that certain behaviours, such as studying, avoiding procrastination, persevering at work, keeping a diet or eating fruits and vegetables are intrinsically desirable positive outcomes (Tangney et al., 2004; Hofmann et al., 2008). Conversely, behaviours such as impaired reasoning, procrastination, eating unhealthy foods, over-eating, smoking and others are coined as undesirable tendencies, given their negative impacts on human life and society (Tangney et al., 2004; Hofmann et al., 2008). Similarly, behaviour that is pro-social, and supports collective well-being, has been conceptualised as desirable, whereas behaviour that supports an individual's self-interest is conceptualised as an undesirable temptation (Martinsson et al., 2014). In this view, pro-environmental behaviour would thus pertain to desirable behaviour, given that not engaging in such behaviour would have negative impacts on human life, on society and on the natural environment, in the long-term, and would not benefit collective well-being, but rather an individual's self-interest. Self-control is argued to influence engagement in desirable behaviour by enabling individuals to effectively overcome undesirable behavioural tendencies (Tangney et al., 2004). Therefore, from this perspective, the first hypothesis is:

H1: Self-control positively influences pro-environmental behaviour.

The majority of self-control studies explore direct relationships between behaviour and self-control, in accordance with these theoretical assumptions. The studies in this chapter will also explore the direct relationships between self-control and behaviour to explore this hypothesis.

Following this, two alternative hypotheses pertaining to the role of goal motivation in relation to self-control will be explored. De Ridder et al. (2012) proposed that although some behaviours may first appear to be undesirable (e.g., smoking), these may in fact not entail self-control failures if an individual does not hold personal goals related to avoiding that behaviour; whether a behaviour is desirable, or undesirable, is influenced by one's goals. Several studies have found

evidence in support of this, suggesting that self-control moderates the relationship between motivation and behaviour, considering the fact that self-control is purported to support individuals in achieving desired goals (Bertrams, 2012; Honkanen et al., 2012). However, other studies argue that motivation and self-control are independent predictors of behaviour, and have found that measures of motivation and self-control act independently to predict behavioural outcomes (Gerrits et al., 2010; Sproesser et al., 2011; Tomasone et al., 2015). Considering that evidence on the how motivation and self-control affect behaviour together is inconclusive, two alternative hypotheses will be explored:

H2a: Self-control moderates the relationship between motivation and behaviour.

H2b: Self-control and motivation independently influence pro-environmental behaviour.

The rest of this chapter outlines considerations related to conducting research and recruiting participants online (which was the approach adopted in the studies in this chapter), followed by a detailed outline of each of the six studies in this chapter and their findings, as well as a general discussion, implications, and limitations of this set of studies.

3.2 Online research and participant recruitment

The studies in this chapter were conducted online, and the participants were recruited online. The main benefits and disadvantages of online research and participant recruitment, as well as methods to address the disadvantages are explored in this section, with a view to reinforcing its adequacy for this research.

Conducting research online has become common practice in psychology and social science research in recent years, with a large proportion of contemporary published research being conducted online (Gosling & Mason, 2015). Online research has numerous advantages compared to traditional laboratory research (Chandler & Paolacci, 2017; Gosling & Mason, 2015). One of the main advantages of online research is access to more diverse samples than traditional undergraduate samples (Gosling & Mason, 2015; Reips, 2002). The increased diversity is an important advantage, considering that overreliance on highly educated, affluent western samples (Henrich, Heine, & Norenzayan, 2010) has been a recurrent criticism of research based on samples of students who receive course credits in return for study participation. While still not fully representative of the general population, online samples are more diverse and can thus reduce the bias found in traditional samples (Gosling, Vazire, Srivastava, & John, 2004). Furthermore, data collection is automated, and can reduce demand characteristics given that the experimenter is not present (Reips, 2002), whereas the anonymity

provided has been shown to increase participants' willingness to disclose information and provide honest answers (Kelly, Harper, & Landau, 2008) and to reduce socially desirable responding (Joinson, 1999). Finally, online research and participant recruitment improve efficiency in data collection and enable researchers to reach large numbers of participants more easily and rapidly (Buchanan & Smith, 1999; Gosling & Mason, 2015).

Online research also has drawbacks. Online research is characterised by a lack of experimental control, as the environment of the participants cannot be controlled, and environmental stimuli may differ between participants (Gosling & Mason, 2015; Hewson, 2015; Reips, 2002). Participants are unsupervised, and the researcher cannot be sure whether they are paying attention to the study, multitasking (e.g., simultaneously watching TV), or following instructions properly (Gosling & Mason, 2015; Hewson, 2015; Riva, Teruzzi, & Anolli, 2003). Differences in hardware, software, and internet connections may also affect the display of experimental stimuli and measurement accuracy (Buchanan & Smith, 1999; Hewson, 2015). Although there is a risk of greater noise due to these issues, using larger sample sizes than similar laboratory research can counter-act this issue (Kraut et al., 2004; Ryan, Wilde, & Crist, 2013). Furthermore, using data quality assurance measures such as attention checks to filter out participants who are not paying attention or following instructions has also been shown to improve data quality relative to traditional laboratory research (Crump, McDonnell, & Gureckis, 2013). A typical attention check involves a question similar in format to other questions, but which requires an unexpected action from the participant (e.g., select "Strongly Disagree"; Gosling & Mason, 2015). Although there has been some debate about the effects of attention checks on survey responses (Vannette, 2017), generally the evidence indicates that attention checks do not significantly affect response behaviour within a survey, whilst they improve data quality to a level similar to laboratory research (Abbey & Meloy, 2017; Crump et al., 2013).

Other concerns related to online research include drop-outs, as not all participants who start an online study complete the full study (Crump et al., 2013; Reips, 2002). However, making the studies more fun, with shorter completion times, has been shown to lead to higher rates of completion (Brown et al., 2014; Crump et al., 2013). Finally, participants may have various motivations to take part, such as curiosity, financial rewards, prosocial motives to help the researcher or interest in the topic (Buchanan & Smith, 1999). However, evidence suggests that different motivations to participate do not bias data from online participants, with no significant differences found between paid and unpaid participants (Abeler & Nosenzo, 2015).

Despite some drawbacks, extensive research demonstrates the quality, validity, and reliability of data collected from online, anonymous, unsupervised, self-selected participants (Gosling &

Mason, 2015). Self-report, questionnaire studies (Buchanan et al., 2005; Gosling et al., 2004; Lewis, Watson, & White, 2009), and experimental research (Brown et al., 2014; Crump et al., 2013; Germine et al., 2012) have shown that participants recruited online generate valid, reliable data consistent with laboratory research using traditionally recruited samples. These data have the added benefit of more diverse samples, not limited by geographic boundaries, along with faster and more efficient data collection (Gosling and Mason, 2015; Hewson, 2015).

3.2.1 Online recruitment tools utilised in this thesis

Studies 1, 2 and 3 utilise several free online recruitment tools: Psychological Research on the Net (https://psych.hanover.edu/research/exponnet.html), Online Social Psychology Studies (http://www.socialpsychology.org/expts.htm), Amazon's Mechanical Turk, social networks (Facebook, Reddit), and a university newsletter. Psychological Research on the Net is an online platform maintained by John Krantz at Hanover College (Krantz, n.d.), where researchers can post their study links for participants to complete. Online Social Psychology Studies is a similar platform, maintained by Scott Plous at Wesleyan University (Plous, n.d.). Amazon's Mechanical Turk is a crowdsourcing platform that enables researchers to post studies and recruit and recompense participants (Buhrmester, Kwang, & Gosling, 2011). Additionally, links to the studies were posted on Facebook, and on the Sample Size sub-Reddit (a forum on a certain topic where users can post content) on Reddit. Reddit Sample Size has over 73000 (in September 2018) subscribers, and is described as "*a community dedicated to scientific, fun, and creative surveys produced for and by redditors*" (Reddit, n.d.) Researchers can post links to their studies, which are updated in real-time on the front page. Researchers can also repost studies that have fallen off the front page, to continue obtaining responses.

The validity of these recruitment tools has been empirically explored, with the general conclusion being that these tools provide a source for collecting good quality, reliable data efficiently that is more diverse than traditional undergraduate samples (Casler, Bickel, & Hackett, 2013; Shatz, 2017). Ryan et al. (2013) found that a sample collected on Psychological Research on the Net produced the same pattern of experimental results when compared to a conventional undergraduate sample, supporting the validity of using this platform for recruiting participants. Social media has also been validated as a recruitment tool. Facebook has been used to recruit participants, through paid advertisements or through posts on different Facebook pages, and has been shown to provide good quality data comparable to traditional samples (Kosinski, Matz, Gosling, Popov, & Stillwell, 2015; Ramo & Prochaska, 2012; Rife, Cate, Kosinski, & Stillwell, 2016). Casler et al. (2013) compared a sample recruited via Facebook and Reddit to a conventional sample, and found no differences in results between these samples.

Shatz (2017) and Jamnik and Lane (2017) also explored the use of Reddit for recruiting participants, and concluded that the data collected from Reddit was more diverse than traditional undergraduate samples, and provided good quality data with good measurement reliability similar to conventional samples. University newsletters have also been successfully used in research (Huber, Nuerk, Reips, & Soltanlou, 2017; Jersakova, Moulin, & O'Connor, 2016) to supplement samples in online studies.

Studies 4, 5 and 6 utilise the Amazon Mechanical Turk, a crowdsourcing platform that enables requesters to outsource human intelligence tasks (HITs) to workers (Behrend, Sharek, Meade, & Wiebe, 2011). Requesters can post any survey or experiment that can be completed on a computer, can refuse payment for subpar work and can limit their tasks to workers with low refusal rates (Buhrmester et al., 2011). Workers are paid once they have completed a specific task and can be recruited online from any geographic location (Behrend et al., 2011). The use of Amazon's Mechanical Turk has substantially increased in recent years in social science, psychology and consumer research (Goodman & Paolacci, 2017). Over 15,000 published papers referenced the Mechanical Turk in the past 10 years (Chandler & Shapiro, 2016) with 27% of studies published in Journal of Consumer Research between 2012-and 2016 being conducted on the Mechanical Turk (Goodman & Paolacci, 2017). The validity and reliability of Mechanical Turk data has been extensively explored, and has been found to be of a high quality, to have high reliability and to be comparable to traditional samples in both questionnaire-based and experimental research (Crump et al., 2013; Gosling & Mason, 2015; Paolacci & Chandler, 2014; Paolacci, Chandler, & Ipeirotis, 2010; Ramsey, Thompson, McKenzie, & Rosenbaum, 2016). Furthermore, Mechanical Turk samples have been shown to be significantly more diverse than typical undergraduate samples in terms of age, education, and employment (Buhrmester et al., 2011; Goodman & Paolacci, 2017).

The recruitment tools reviewed above have been shown to produce data comparable to conventional laboratory research, with the added benefit of more diverse samples and increased efficiency in data collection. Furthermore, in recent years there has been a trend towards incorporating more online research in published studies. Although online research has its drawbacks, the evidence indicates that the use of measures designed to improve data quality can lead to data of a standard similar to that of traditional laboratory research. The studies in this chapter employed these recruitment tools and were conducted online, using attention checks as data quality assurance measures shown to improve data quality and reliability.

3.3 Study 1

Study 1 aims to understand the association between self-control and a general composite measure of pro-environmental behaviour, and how it influences behaviour in relation to pro-environmental motivation, operationalised using a measure of environmental attitudes.

Environmental attitudes are seen as a key pre-requisite to pro-environmental behaviour and represent an important motivational component for engaging in pro-environmental behaviour (Best & Mayerl, 2013; Kaiser, Wolfing Kast, & Fuhrer, 1999; Lindenberg & Steg, 2007; Milfont & Duckitt, 2004). As highlighted in Chapter 2, the term "environmental attitudes" has been used interchangeably with "environmental concern" to denote individuals' evaluations related to protecting the natural environment (Milfont & Duckitt, 2004). The literature exploring motivational factors involved in pro-environmental behaviour has focused extensively on environmental attitudes, as environmental attitudes are the most widely researched predictor of pro-environmental behaviour (Amburgey & Thoman, 2012; Milfont & Duckitt, 2010). Considering the importance accorded to environmental attitudes as a strong motivation to engage in pro-environmental behaviour, the current study will explore environmental attitudes as key motivation for pro-environmental behaviour.

The study will address the three hypotheses outlined at the beginning of the chapter. First, as self-control is correlated with a range of desirable behavioural outcomes (Tangney et al., 2004), including prosocial behaviours related to co-operation (Martinsson et al., 2014), it was hypothesised that there would be a similar positive relationship between pro-environmental behaviour and self-control (H1). The study will explore this hypothesis. Secondly, it is argued that once motivation (i.e., attitudes) to engage in a behaviour is developed, self-control supports the pursuit of behaviour in accordance to that motivation (Gollwitzer, 1999). Individuals high in self-control would be better equipped to overcome obstacles in the way of their motivations and thus more likely to engage in motivated behaviour than those low in self-control. Therefore, motivation should be more closely associated with pro-environmental behaviour for individuals high in self-control, than for those low in self-control, for whom attitudes would not be expected to be strongly associated with behaviour. Based on this, it was hypothesised that self-control should moderate the relationship between attitudes and pro-environmental behaviour (H2a). However, other research has failed to find evidence of this moderating effect, suggesting that self-control influences behaviour independently of motivation (Sproesser et al., 2011; Tomasone et al., 2015). An alternative hypothesis, that self-control and attitudes both predict pro-environmental behaviour (H2b), was developed based on this literature. The study also aims to understand which of these two hypotheses is supported.

3.3.1 Participants

Participants for this study were recruited online, via platforms for conducting psychology research, such as Psychological Research on the Net (https://psych.hanover.edu/research/exponnet.html), Online Social Psychology Studies (http://www.socialpsychology.org/expts.htm), social networks (Facebook, Reddit), as well as a university newsletter. An optional prize draw for a £20 voucher was offered to participants. In total, 336 participants completed the study. Following filtering based on responses to the attention check, 308[1] viable answers remained. Ages ranged between 18-74 (M = 26.92, SD = 9.35); there were 183 female, 121 male, and 4 who selected "Other" gender. Informed consent was given prior to the study, which was approved by the University of St Andrews Ethics Committee.

3.3.2 Measures

3.3.2.1 Self-control

The study employs Tangney et al.'s (2004) Brief Self-Control Scale to measure the ability to overcome undesired response tendencies and refrain from acting on those tendencies. The Brief Self-Control Scale has exhibited good reliability and validity across numerous studies (de Ridder et al. 2012; Tangney et al., 2004), and it is one of the most widely utilised measures of self-control, in a variety of domains, including psychology and consumer research (de Ridder et al., 2012; Haws et al., 2016).

The 13 items of the scale are measured on a five-point scale, ranging from 1 ("Not at all") to 5 ("Very much"). Participants were asked to "Please indicate how much each of the following statements reflects how you typically are." Examples of items include "I am good at resisting temptation" and "Sometimes I can't stop myself from doing something, even if I know it is wrong." The full scale can be found in Appendix A. A higher score on the scale indicates better trait self-control ability. In this study, the scale also had good internal reliability, with Cronbach's $\alpha = .87$.

3.3.2.2 Pro-environmental behaviour

Pro-environmental behaviour was measured using a modified version of the Pro-Environmental Behaviour Scale (Barbaro & Pickett, 2015; Whitmarsh & O'Neill, 2010). The original scale (Whitmarsh & O'Neill, 2010) included 24 items that formed a reliable measure of pro-environmental behaviour. The current study utilises a shorter version that omits the first seven questions, used by Barbaro and Pickett (2015), who obtained good internal reliability ($\alpha = .77$).

[1] Twenty-eight responses were eliminated due to failing the attention check.

This version was utilised because, similar to Barbaro and Pickett's study (2015), the first seven questions would not be applicable to a large part of the sample. The study was intended to be distributed to a large sample, including students and younger individuals unlikely to own homes, and for whom questions related to home ownership would not be relevant (e.g., "Installed insulation products in your home" or "Bought an energy efficient home"). To ensure the study could be filled in by as wide a sample as possible, this study employs the shorter version used by Barbaro and Pickett (2015), in which these questions related to home ownership and home improvements were omitted.

Participants indicated how often they engaged in a set of behaviours (e.g., "Buy environmentally-friendly products," "Recycle," and "Buy products with less packaging"). The 17-items were measured on a four-point scale, with higher scores indicating more frequent engagement in pro-environmental behaviour (0 = Never, 1 = Occasionally, 2 = Often, 3 = Always). The full scale can be found in Appendix A. The scale also had good internal reliability, with Cronbach's $\alpha = .76$.

3.3.2.3 Environmental attitudes

Although environmental attitudes have been measured using a variety of measures, the most popular measure of general environmental attitudes in the literature is the New Environmental Paradigm (Dunlap et al., 2000; Hawcroft & Milfont, 2010) abbreviated as NEP. The NEP includes 15 items that assess five domains of beliefs about humans in relation to the natural environment: the existence of limits for societal growth, anti-anthropocentrism, the fragility of nature's balance, rejection of the idea that humans are exempt from the constraints of nature, and the possibility of an eco-crisis or ecological catastrophe (Dunlap et al., 2000). The scale was validated and showed good internal reliability in numerous studies (Dunlap et al., 2000).

This study adopts a modified 10-item scale used by Clark, Kotchen and Moore (2003), selected to reduce the length of the survey instrument. The modified scale includes two items for each of the five domains of the original scale, and it showed good internal reliability (Cronbach's $\alpha = .80$), suggesting all items could be combined into a single measure of environmental attitudes (Clark et al., 2003). The items were rated on a five-point scale (1 = Strongly disagree, 5 = Strongly agree). The full scale can be found in Appendix A. The scale used in this study also had good internal reliability, with Cronbach's $\alpha = .77$.

3.3.3 Procedure

The questionnaire was built using the Qualtrics platform, and it was distributed online to participants over the age of 18, from the general population. The survey instrument included a

section for obtaining informed consent, followed by the self-control, NEP, and pro-environmental behaviour measures. The order in which these three measures were presented was counterbalanced. Then participants were presented with questions regarding demographic information. The data was analysed using SPSS.

3.3.4 Results

The descriptive statistics for the three measures in the study can be found in Table 1.

Table 1. Descriptive statistics for pro-environmental behaviour, self-control and NEP

Variables	Mean	Median	Standard Deviation	Min	Max
Pro-environmental behaviour	1.43	1.41	0.41	0.35	2.82
Self-control	3.18	3.23	0.67	1.31	4.77
NEP	3.70	3.80	0.64	1.50	5.00

A Pearson correlation was conducted to explore H1, that self-control is positively related to pro-environmental behaviour. As predicted, self-control was significantly correlated with pro-environmental behaviour ($r = .14$, $p = .017$). A post-hoc power analysis using G*Power 3 (Faul, Erdfelder, Lang, & Buchner, 2007) revealed that, with an alpha level of .05, a power level of 69% was obtained for this test.

An additional, unexpected correlation was found between environmental attitudes (NEP) and self-control ($r = –.12$, $p = .031$). Similar to previous findings in the literature, NEP was found to positively correlate with pro-environmental behaviour ($r = .37$, $p < .001$). The correlations can also be seen in Table 2.

Table 2. Pearson correlations between the variables in Study 1

	Pro-environmental behaviour	Self-control
Pro-environmental behaviour	-	
Self-control	.14*	-
NEP	.37**	–.12*

*p < .05, **p < .01

To explore the two alternative hypotheses (H2a and H2b) relating to environmental attitudes and self-control, further analyses were conducted.

To understand whether self-control moderates the relationship between attitudes and pro-environmental behaviour (H2a), a moderation analysis was conducted, using Hayes' (2018) PROCESS macro, which has the advantages of computing the interaction term automatically and providing information for slope analysis (Field, 2018). Using Model 1, with 5000 bootstrap re-samples, NEP was entered as the predictor variable, with pro-environmental behaviour as the outcome variable and self-control as the moderator. The predictor variables were not mean centred. Mean centring is not required when testing and probing a single interaction in a linear model (Hayes & Matthes, 2009), which is the case in this study – the aim of the analysis is to identify whether self-control has a moderating effect on the relationship between attitudes and pro-environmental behaviour. Centring the predictors does not affect the detection of the interaction effects, the coefficients of the interaction effects, nor the overall measure of variance (R^2) explained by the model, which remain the same whether the variables are centred or not (Cohen, Cohen, West, & Aiken, 2003; Echambadi & Hess, 2007; Shieh, 2011). The same approach for the moderation analysis was adopted in all the studies in this chapter that address H2a.

In this study, the moderation analysis revealed no significant interaction between self-control and the NEP (b = 0.002, 95% CI [-0.093, 0.098], p = .965), as it can be seen in Table 3. The findings in this study thus do not support H2a. The regression coefficients for the moderation analysis can be seen in Table 3.

Table 3. Summary of multiple regression for moderation analysis

Variables	b	SE B	t	p
NEP	0.24	0.17	1.46	p = .146
Self-control	0.10	0.18	0.56	p = .573
Self-control x NEP	0.002	0.05	0.04	p = .965

Note: Fit for model $R^2 = .17$, $F(3, 304) = 20.49$, $p < .001$

A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an effect size $f^2 = .00001$, and an alpha level of .05, a power level of 5% was obtained for detecting the contribution of the interaction to the model. However, given the sample size N = 308, and an alpha level of .05, to detect Bertrams' (2012) effect size $f^2 = .027$ for the interaction between motivation and self-control, a power level of 82% would have been obtained.

To test H2b, a two-stage hierarchical regression was conducted with pro-environmental behaviour as the dependent variable. Environmental attitudes (NEP) were entered at Step One of the regression, considering that known predictors should be entered into hierarchical regression model first (Field, 2018). The NEP is a well-known and researched predictor of pro-environmental behaviour (Dunlap et al., 2010). Self-control was entered at Step Two, as a new predictor of pro-environmental behaviour.

The hierarchical regression revealed that at Step One, NEP contributed significantly to the regression model, $F(1, 306) = 47.66$, $p < .001$, and accounted for 14% of the variation in pro-environmental behaviour. In Step Two, the two predictors explained 17% of the variance in pro-environmental behaviour, ($R^2 = .17$, $F(2, 305) = 30.83$, $p < .001$). Both self-control ($\beta = .18$, $p = .001$) and the NEP ($\beta = .39$, $p < .001$) were statistically significant predictors. Adding self-control to the regression model explained an additional 3% of the variation in pro-environmental behaviour, and this change in R^2 was significant ($p = .001$). A summary of the regression analysis can be seen in Table 4. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) showed that, with an alpha level of .05, and an effect size $f^2 = .036$, a power level of 91% was obtained for detecting the increase in variance explained by adding self-control to the model.

Table 4. Summary of hierarchical regression analysis for variables predicting pro-environmental behaviour

Variables	B	SE B	β	R^2	ΔR^2
Step 1				.14	.14**
NEP	0.23	0.03	.37**		
Step 2				.17	.03**
NEP	0.25	0.03	.39**		
Self-control	0.11	0.03	.18**		

*p < .05, **p < .01

3.3.5 Discussion

The findings indicated a positive correlation between pro-environmental behaviour and self-control, supporting H1. The magnitude of the relationship observed in this study between pro-environmental behaviour and self-control ($r = .14$), is slightly lower than the typical range of effects found for trait self-control (r between .17 and .36) (de Ridder et al., 2012). However, the

composite pro-environmental behaviour scale included a wide range of behaviours with different characteristics. Some of these may be less subject to individual self-control, and more influenced by situational aspects. For instance, an individual who has to regularly fly for work cannot easily reduce the amount of flying they do without an impact on their employment.

An unexpected finding was a negative correlation between environmental attitudes and self-control, for which no theoretical basis was found in the literature. In particular, past research has indicated that self-control does not affect attitudes (Osgood & Muraven, 2015), suggesting that self-control tends to only affect behaviour, rather than the goal content that underlies behaviour. A possible explanation would be that this correlation may have occurred spuriously in the sample explored.

The literature also suggests that for self-control effects to occur, individuals must possess the motivation to engage in a behaviour (Hagger, 2013). Therefore, the study also aimed to understand how motivation and self-control influence behaviour. H2a was not supported. No moderating effect of environmental attitudes on the relationship between pro-environmental behaviour and self-control was found. The findings supported H2b and indicated that self-control and motivational components are independent predictors of behaviour, consistent with the findings of Tomasone et al. (2015), Sproesser et al. (2011) and Gerrits et al. (2011). In this study, self-control explained variance in pro-environmental behaviour above and beyond environmental attitudes.

The range of behaviours measured in the pro-environmental behaviour scale was very diverse. Although the scale showed good internal reliability, it may be that certain behaviours included (e.g., eating organic food or shopping online), may not be perceived as environmentally-friendly. Furthermore, despite the attention received in the literature, environmental attitudes, or environmental concern, are only one of many possible motivational factors affecting pro-environmental behaviour (Stern, 2000). Some argue that they are less closely linked to behaviour than other motivational constructs, such as specific attitudes to a given pro-environmental behaviour (Bamberg, 2003). The current study included a composite measure of pro-environmental behaviour, and it was not possible to measure specific attitudes to specific types of pro-environmental behaviour. Therefore, the study included general attitudes (NEP). However, it may be insightful to understand whether more specific attitudes moderate the relationship between behaviour and self-control, given that general attitudes such as the NEP are considered to be more distant from behaviour (Bamberg, 2003).

3.4 Study 2

Study 1 explored the relationship between a general, composite measure of pro-environmental behaviour and self-control. Study 2 aims to explore whether self-control is related to a specific pro-environmental behaviour, and thus explores the relationship between self-control and a measure of recycling behaviour. Study 2 also explores how self-control influences this behaviour together with motivation, since both motivation and volition are presumed to be involved in behaviour (Mann et al., 2013). Motivation was operationalised as specific attitudes to recycling behaviour.

The choice of behaviour was motivated by several reasons. Recycling is one of the most frequently measured pro-environmental behaviours, with major benefits for the environment (Chan & Bishop, 2013). Recycling leads to reduced demand for natural resources, whilst waste sent to landfills produces greenhouse gases that contribute to climate change (Chan & Bishop, 2013; UK Government, 2018). Furthermore, recycling and reusing materials reduces the need to extract, process and transport new, virgin materials. In turn, this leads to less energy being required for production processes, and therefore to lower emissions (Swim et al., 2011). This is particularly significant since the production of plastic, paper, and aluminium goods, which are all recyclable materials, is a main source of carbon emissions (Allwood, Ashby, Gutowski, & Worrell, 2011).

On the other hand, recycling also involves obstacles, such as increased effort, inconvenience, and time required to sort waste, and transport it to adequate recycling facilities, which may often be far away (Chen & Tung, 2010; Garcés et al., 2002; Perrin & Barton, 2001; Tonglet, Phillips, & Bates, 2004). Because recycling requires individuals to expend extra time sorting and finding recycling bins, self-control may be relevant. One may need to overcome a conflict between self-interest (saving time or convenience) and benefitting the environment.

Furthermore, Study 2 also focuses on specific attitudes to recycling behaviour, as opposed to the general environmental attitudes explored in Study 1. Specific attitudes are considered to be more strongly related to behaviour than general attitudes (Ajzen & Madden, 1986). For stronger attitude-behaviour relations to be observed, the level of attitudes measured should correspond to the level of behaviour measured (Ajzen & Fishbein, 1969). Since this study is focused on a specific behaviour, recycling, specific attitudes to this behaviour will be included. The pro-environmental behaviour literature has also addressed the roles of specific attitudes as part of models such as the Theory of Planned Behaviour, which has been used to explain various pro-environmental behaviours (Bamberg, 2003; Bamberg & Möser, 2007; de Leeuw et al., 2015), including recycling in particular (Tonglet, Phillips, & Read, 2004). In much of this research,

specific attitudes are regarded as a strong motivation to engage in pro-environmental behaviour (Lindenberg & Steg, 2007). Although the Theory of Planned Behaviour focuses on specific attitudes, the assumption is that general environmental attitudes influence specific behavioural attitudes, rather than behaviour directly (Bamberg, 2003). In turn, specific attitudes should be a stronger determinant of behaviour, as demonstrated by Bamberg (2003), where specific attitudes strongly predicted whether individuals would request a brochure about 'green' electricity products. The current study thus aims to explore specific attitudes to a pro-environmental behaviour, as they purportedly influence pro-environmental behaviour more closely than general environmental attitudes (Bamberg, 2003).

As in the previous study, the three hypotheses were explored. First, the study aims to understand whether self-control correlates with a specific pro-environmental behaviour – recycling (H1). Secondly, considering that specific attitudes are conceptualised as an important behavioural motivation, the study attempts to understand whether the effect of specific attitudes on recycling behaviour is moderated by self-control (H2a), or whether the two act as independent predictors of recycling (H2b).

3.4.1 Participants

A total of 437 participants were recruited via the same platforms for conducting psychology research and social media utilised for Study 1. An optional prize draw for a £20 voucher was offered to participants. Following filtering based on responses to attention checks, 417[2] viable answers remained. Ages ranged between 18-74 (M = 25.65, SD = 23.00); 255 were female, 156 male, and 6 selected "Other" gender. Informed consent was given prior to the study, which was approved by the University of St Andrews Ethics Committee.

3.4.2 Measures

3.4.2.1 Self-control

The self-control measure was the same as that in Study 1, namely the Brief Self-Control Scale (Tangney et al., 2014). The other measures can be found below.

3.4.2.2 Recycling behaviour

Past recycling behaviour was measured using a 5-point frequency scale (1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often, 5 = Always), adapted from Tonglet, Phillips and Read (2004), Barr (2007), and Huffman, Van Der Werff, Henning and Watrous-Rodriguez (2014). Participants were asked how frequently they recycled a set of various types of household waste: paper, glass,

[2] Twenty responses were eliminated due to failing the attention check.

cardboard, plastic, drinks and food cans, and textiles.

The scale demonstrated good internal reliability (Cronbach's α = .84), and Principal Component Analysis revealed only one factor explaining 58% of variance.

3.4.2.3 Recycling attitudes

Attitudes towards recycling were measured using seven-point semantic differential scales, as recommended by Ajzen (1991). Furthermore, as attitudes are one's overall evaluation of a construct, they include both an instrumental and experiential component (Fishbein & Ajzen, 2010). As per Fishbein and Ajzen's (2010) recommendation, different items were included to account for the instrumental aspect of attitudes (e.g., "harmful-beneficial") and the experiential element (e.g., "unpleasant-pleasant"), as well as a "bad-good" scale to capture one's overall evaluation.

The semantic differential scale featured seven items, adapted from past papers on recycling attitudes (Carfora, Caso, Sparks, & Conner, 2017; Carrus, Passafaro, & Bonnes, 2008; Huffman et al., 2014; Sparks & Shepherd, 1992; Tonglet, Phillips, & Read, 2004). The items were: bad-good, harmful-beneficial, unpleasant-pleasant, foolish-wise, unnecessary-necessary, not rewarding-rewarding, and useless-useful. Participants were asked to rate their responses to each of these statements on a scale from 1 to 7 (e.g., recycling is bad/good, 1 = Bad, 7 = Good). The scale demonstrated good internal reliability (Cronbach's α = .81) and Principal Component Analysis revealed only one factor explaining 55% of variance.

3.4.3 Procedure

The questionnaire was built using the Qualtrics platform and was distributed on several platforms for conducting research online, to participants over 18 from the general population. The survey instrument included a section for obtaining informed consent, followed by the self-control scale, recycling attitudes, and a recycling behaviour measure. The order in which these three measures were presented was counterbalanced. The participants then were then presented with questions regarding demographic information. The data was analysed using SPSS.

3.4.4 Results

The descriptive statistics for the three measures in the study can be found in Table 5.

Table 5. Descriptive statistics for recycling behaviour, self-control and recycling attitudes

Variables	Mean	Median	Standard Deviation	Min	Max
Recycling behaviour	3.83	4.00	0.86	1.00	5.00
Self-control	3.28	3.31	0.61	1.23	4.85
Recycling attitudes	6.27	6.43	0.72	3.29	7.00

A Pearson correlation was computed to explore the hypothesis that self-control is positively related to recycling behaviour (H1). As predicted, self-control was significantly correlated with recycling behaviour ($r = .18$, $p < .001$). A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an alpha level of .05, a power level of 96% was obtained for this test.

As expected, no significant correlation was found between recycling attitudes and self-control ($r = .04$, $p = .470$). Moreover, recycling attitudes were found to positively correlate with pro-environmental behaviour ($r = .37$, $p < .001$), as expected from the literature. The correlations can also be seen in Table 6.

Table 6. Pearson Correlations between the variables in Study 2

	Recycling behaviour	Self-control
Recycling behaviour	-	
Self-control	.18**	-
Recycling attitudes	.37**	.04

**p < .01

To explore the two alternative hypotheses relating to recycling attitudes, further analyses were conducted.

To understand if self-control moderates the relationship between attitudes and pro-environmental behaviour (H2a), a moderation analysis was conducted using Hayes' (2018) PROCESS macro (Model 1, 5000 bootstrap re-samples, variables were not mean centred). Recycling attitudes was entered as the predictor variable, with pro-environmental behaviour as

the outcome variable and self-control as the moderator. No statistically significant interaction between attitudes and self-control, b = 0.09, 95% CI [-0.251, 0.077], p = .297, was found. Thus, in this study, H2a was not supported. The regression coefficients for the moderation analysis can be seen in Table 7.

Table 7. Summary of multiple regression for moderation analysis

Variables	b	SE B	t	p
Attitude	0.71	0.28	2.55	p = .011
Self-control	0.78	0.53	1.48	p = .138
Self-control x Attitude	0.09	0.08	-1.04	p = .297

Note. Fit for model $R^2 = .16$, $F(3, 413) = 27.04$, $p < .001$

A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an effect size $f^2 = .003$, and an alpha level of .05, a power level of 20% was obtained for detecting the contribution of the interaction to the model. However, given the sample size N = 417, and an alpha level of .05, to detect Bertrams' (2012) effect size $f^2 = .027$ for the interaction between motivation and self-control, a power level of 92% would have been obtained.

To test H2b, a two-step hierarchical regression was conducted with pro-environmental behaviour as the dependent variable. Recycling attitudes were entered at Step One of the regression, as they are researched predictors of recycling. Self-control was added at Step Two.

The hierarchical regression revealed that at Step One, recycling attitudes contributed significantly to the regression model, $F(1, 415) = 63.78$, $p < .001$, and accounted for 13% of the variation in recycling behaviour. In Step Two, the two predictors explained 16% of the variance, ($R^2 = .16$, $F(2, 414) = 40.00$, $p < .001$). Adding self-control to the regression model explained an additional 3% of the variation in recycling behaviour, and this change in R^2 was significant ($p < .001$). Both self-control ($\beta = .17$, $p < .001$) and recycling attitudes ($\beta = .36$, $p < .001$) were statistically significant predictors. A summary of the regression analysis can be seen in Table 8. A post-hoc power analysis using G*Power 3 (Faul et al., 2007), showed that, with an alpha level of .05, and an effect size $f^2 = .036$, a power level of 97% was obtained for detecting the increase in variance explained by adding self-control to the model.

Table 8. Summary of hierarchical regression analysis for variables predicting recycling behaviour

	B	SE B	β	R^2	ΔR^2
Step 1				.13	.13**
Recycling attitudes	0.43	0.05	.37**		
Step 2				.16	.03**
Recycling attitudes	0.43	0.05	.36**		
Self-control	0.24	0.06	.17**		

*p < .05, **p < .01

3.4.5 Discussion

The results from Study 2 were consistent with those from Study 1. A positive correlation was found between recycling and self-control, providing further evidence in support of the hypothesis that self-control influences pro-environmental behaviour (H1). The size of the relationship was within the typical range of effects that trait self-control has on other behaviours (r between 0.17 and 0.36) (de Ridder et al., 2012). Notably, no correlation was found in this study between recycling attitudes and self-control, thereby failing to corroborate the surprising association, obtained in Study 1, between environmental attitudes and self-control.

Additionally, it was found that recycling attitudes and self-control independently predict recycling behaviour (H2b). In this study, self-control explained variance in recycling behaviour above and beyond recycling attitudes. The alternative hypothesis, that self-control moderates the relationship between recycling behaviour and attitudes (H2a), was not supported, even when exploring a component of motivation theorised to be more closely related to behaviour (i.e., specific attitudes) than the one explored in Study 1.

Studies 1 and 2 thus demonstrate a consistent relationship between pro-environmental behaviour and self-control, both for a general measure of pro-environmental behaviour, and for the specific measure of recycling. Moreover, both studies provide evidence that self-control predicts pro-environmental behaviour above and beyond general environmental, or specific attitudes.

3.5 Study 3

Study 3 aims to add further support to the findings of Studies 1 and 2, by gathering additional data on the relationship between self-control and recycling, and to provide additional evidence regarding the relationship between general environmental attitudes (NEP) and self-control. Study 1 found an unexpected relationship between self-control and general environmental attitudes, which does not have theoretical support. The current study aims to better understand whether the correlation found in Study 1 is a robust finding, or is consistently replicated empirically in different samples. This study will explore the same hypotheses (H1, H2a and H2b) as in Studies 1 and 2, in relation to recycling behaviour.

3.5.1 Participants

Participants were recruited via Reddit Sample Size. A total of 504 participants completed the study. Following filtering based on responses to attention checks and duplicate IP addresses, 476[3] viable answers remained. Ages ranged between 18-69 ($M = 25.87$, $SD = 8.47$); 211 were female, 260 male, and 5 selected "Other" gender. Informed consent was given prior to the study, which was approved by the University of St Andrews Ethics Committee.

3.5.2 Measures

The self-control, specific attitudes, and recycling behaviour measures used were the same as in Study 2. The NEP measure was a short, 5-item measure used by Stern et al. (1999), which was utilised to reduce the length of the survey instrument. The items were rated on a five-point scale (1 = Strongly disagree, 5 = Strongly agree). The full scale can be found in Appendix A. The scale showed good internal reliability (Cronbach's $\alpha = .73$ in the original study by Stern et al. (1999) and in the current study (Cronbach's $\alpha = .74$).

3.5.3 Procedure

The questionnaire was built using the Qualtrics platform and was distributed online, on Reddit Sample Size, to participants over 18 from the general population. The survey instrument included a section for obtaining informed consent, followed by the recycling behaviour measure, the self-control scale, recycling attitudes, and general environmental attitudes. The participants then were then presented with questions regarding demographic information. The data was analysed using SPSS.

[3] Twenty-six responses were eliminated due to failing the attention check. Two responses were eliminated due to duplicate IP addresses.

3.5.4 Results

The descriptive statistics for the four measures in the study can be found in Table 9.

Table 9. Descriptive statistics for pro-environmental behaviour, self-control and NEP

Variable	Mean	Median	Standard Deviation	Min	Max
Recycling behaviour	3.23	3.50	0.99	1.00	5.00
Self-control	3.02	3.00	0.63	1.41	4.75
Recycling attitudes	5.65	6.00	1.26	1.00	7.00
NEP	4.15	4.20	0.68	1.40	5.00

A Pearson correlation (Table 10) was computed to explore the hypothesis that self-control is positively related to recycling behaviour (H1). As predicted, self-control was significantly correlated with recycling behaviour ($r = .15$, $p = .001$). A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an alpha level of .05, a power level of 91% was obtained for this test.

As expected, no significant correlation was found between recycling attitudes and self-control ($r = .07$, $p = .152$). Recycling attitudes were found to positively correlate with pro-environmental behaviour ($r = .27$, $p < .001$), and with the NEP ($r = .16$, $p < .001$), as expected from the literature. No significant correlation was found between the NEP and self-control ($r = .04$, $p = .378$).

Table 10. Pearson Correlations between the variables in Study 3

	Recycling behaviour	Self-control	Recycling attitudes
Recycling behaviour	-		
Self-control	.15**	-	
Recycling attitudes	.27**	.07	-
NEP	.16**	.04	.28**

*p < .05, **p < .01

To explore the two alternative hypotheses relating to attitudes, further analyses were conducted. Considering that recycling attitudes are the recommended predictor when measuring specific behaviour (Ajzen & Fishbein, 1977), whereas general attitudes are recommended for general behaviour, specific attitudes were used in this set of analyses.

To understand whether self-control moderates the relationship between attitudes and pro-environmental behaviour (H2a), a moderation analysis was conducted using Hayes' (2018) PROCESS macro (Model 1, 5000 bootstrap re-samples, variables were not mean centred). Recycling attitudes was entered as the predictor variable, with recycling behaviour as the outcome variable and self-control as the moderator. No statistically significant interaction between attitudes and self-control, b = 0.08, 95% CI [-0.039, 0.207], p = .180, was found. The regression coefficients for the moderation analysis can be seen in Table 11.

Table 11. Summary of multiple regression for moderation analysis

	b	SE B	t	p
Attitude	-0.05	0.19	-0.27	p = .789
Self-control	-0.28	0.37	-0.76	p = .448
Self-control x Attitude	0.08	0.06	1.34	p = .180

Note. Fit for model $R^2 = .09$, $F(3, 472) = 15.88$, $p < .001$

A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an effect size $f^2 = .004$, and an alpha level of .05, a power level of 28% was obtained for detecting the contribution of the interaction to the model. However, given the sample size N = 476, and an alpha level of .05, to detect Bertrams' (2012) effect size $f^2 = .027$ for the interaction between motivation and self-control, a power level of 95% would have been obtained.

To test H2b, a two-step hierarchical regression was conducted with pro-environmental behaviour as the dependent variable. Recycling attitudes were entered at Step One of the regression, as they are researched predictors of recycling. Self-control was added at Step Two.

The hierarchical regression revealed that at Step One, recycling attitudes contributed significantly to the regression model, $F (1, 474) = 36.60$, $p < .001$, and accounted for 7% of the variation in recycling behaviour. In Step Two, the two predictors explained 9% of the variance, ($R^2 = .09$, $F(2, 473) = 22.88$, $p < .001$). Adding self-control to the regression model explained an additional 2% of the variation in recycling behaviour, and this change in R^2 was significant ($p = .004$). Both self-control ($\beta = .13$, $p = .004$) and recycling attitudes ($\beta = .26$, $p < .001$) were

statistically significant predictors. A summary of the regression analysis can be seen in Table 12. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) showed that, with an alpha level of .05, and an effect size $f^2 = .022$, a power level of 90% was obtained.

Table 12. Summary of hierarchical regression analysis for variables predicting recycling behaviour

	B	SE B	β	R^2	ΔR^2
Step 1				.07	.07**
Recycling attitudes	0.21	0.04	.27**		
Step 2				.09	.02**
Recycling attitudes	0.20	0.04	.26**		
Self-control	0.20	0.07	.13**		

*p < .05, **p < .01

3.5.5 Meta-analysis

Additionally, a meta-analysis was conducted to better understand the overall effects of self-control across Studies 1, 2 and 3 (N = 1201). Z-scores were computed for the attitude measures (NEP in Study 1, Recycling attitudes in Studies 2 and 3), behaviour measures (general measure of pro-environmental behaviour in Study 1, Recycling behaviour in Studies 2 and 3), and self-control (same measure in all 3 studies).

A Pearson correlation (Table 13) was computed to explore the hypothesis that self-control is positively related to pro-environmental behaviour (H1). As predicted, self-control was significantly correlated with pro-environmental behaviour (r = .16, p < .001). A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an alpha level of .05, a power level of 100% was obtained.

Similar to prior findings in the literature, attitudes were found to positively correlate with pro-environmental behaviour (r = .33, p < .001). As expected, no correlation was found between attitudes and self-control (r = .01, p = .810).

Table 13. Pearson correlations between pro-environmental behaviour, self-control and attitudes

	Pro-environmental behaviour	Self-control
Pro-environmental behaviour	-	
Self-control	.16**	-
Attitudes	.33**	.01

*p < .05, **p < .01

To understand whether self-control moderates the relationship between attitudes and pro-environmental behaviour (H2a), a moderation analysis was conducted using Hayes' (2018) PROCESS macro (Model 1, 5000 bootstrap re-samples, variables were not mean centred). Attitudes were entered as the predictor variable, with behaviour as the outcome variable and self-control as the moderator.

The interaction between self-control and attitudes was not significant, b = 0.01, 95% CI [-0.047, 0.061], p = .794, suggesting that self-control does not moderate the relationship between attitudes and behaviour. The regression coefficients for the moderation analysis can be seen in Table 14.

Table 14. Summary of multiple regression for moderation analysis

	b	SE B	t	p
Attitude	0.33	0.03	12.01	p < .001
Self-control	0.15	0.03	5.70	p < .001
Self-control x Attitude	0.01	0.03	0.26	p = .794

Note. Fit for model R^2 = .13, F(3, 1197) = 59.95, p < .001

A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an effect size f^2 = .00005, and an alpha level of .05, a power level of 6% was obtained for detecting the contribution of the interaction to the model. Given the sample size N = 1201, and an alpha level of .05, to detect Bertrams' (2012) effect size f^2 = .027 for the interaction between motivation and self-control, a power level of 100% would have been obtained.

To explore H2b, a two-step hierarchical regression was conducted with pro-environmental behaviour as the dependent variable. Environmental attitudes were entered at Step One of the regression, and self-control was entered at Step Two.

The hierarchical regression revealed that at Step One, attitudes contributed significantly to the regression model, $F(1, 1199) = 143.52$, $p < .001$, and accounted for 11% of the variation in pro-environmental behaviour. In Step Two, the two predictors explained 13% of the variance, ($R^2 = .13$, $F(2, 1198) = 89.96$, $p < .001$). Adding self-control to the regression model explained an additional 2% of the variation in pro-environmental behaviour, and this change in R^2 was significant ($p < .001$). Both self-control ($\beta = .15$, $p < .001$) and attitudes ($\beta = .33$, $p < .001$) were statistically significant predictors. A summary of the regression analysis can be seen in Table 15. A post-hoc power analysis using G*Power 3 (Faul et al., 2007), showed that, with an alpha level of .05, and an effect size $f^2 = .023$, a power level of 100% was obtained.

Table 15. Summary of hierarchical regression analysis for variables predicting behaviour

	B	SE B	β	R^2	ΔR^2
Step 1				.11	.11**
Attitudes	0.33	0.03	.33**		
Step 2				.13	.02**
Attitudes	0.33	0.03	.33**		
SCS	0.15	0.03	.15**		

*p < .05, **p < .01

3.5.6 Discussion

The findings from Study 3 replicated the findings from Study 1 and Study 2 in a different sample of respondents. A constant finding throughout Studies 1, 2, and 3 is that self-control positively correlates with pro-environmental behaviour, supporting H1. Furthermore, it was also found that self-control predicts behaviour above and beyond environmental motivational components such as attitudes, across the three studies, supporting H2b. Self-control was not found to moderate the attitude-behaviour relationship, thus not supporting H2a. Furthermore, the study also shows that the NEP is not significantly related to self-control, indicating that the corresponding correlation found in Study 1 might have been spurious.

Although the findings generally suggest that self-control is related to pro-environmental behaviour, due to the correlational design of the studies, causality cannot be established.

Therefore, the next studies aim to understand how varying participants' self-control experimentally affects their pro-environmental decisions.

3.6 Study 4

Study 4 explores the relationship between pro-environmental behaviour and self-control (H2), with the aim to provide causal evidence for the role of self-control in pro-environmental behaviour, by manipulating individual self-control situationally. In this experiment, participants' perceptions of own self-control were manipulated, as these have previously been shown to decrease individuals' self-control ability in tasks that require self-control (Ein-Gar, 2015; Ein-Gar & Steinhart, 2017). Participants were thus primed with high or low self-control (i.e., whether they think they tend to behave in a manner that demonstrates high or low self-control) (Ein-Gar & Steinhart, 2017). A similar procedure was used by Ein-Gar and Steinhart (2011), vanDellen and Hoyle (2010), Ein-Gar (2015), Nikolova et al. (2015), and by Ein-Gar and Steinhart (2017) to alter individuals' perceptions of self-control.

The manipulation is based on asking participants to explain their similarity to a person with high or low self-control, by referring to at least two of their goals. To do so, individuals must recall and write about two instances of their own self-control successes or failures. Nikolova et al. (2015) found that when participants had to recall two instances in which they exercised self-control (easy recall), they relied on the content of recall to infer that they were good or bad at self-control, which led to behaviour congruent with the content of their recall. Participants who recalled succumbing to temptation exercised less self-control in a subsequent decision, whereas those who recalled resisting temptations showed self-control in the self-control decision. Similarly, being able to resist temptation was shown to signal to consumers their ability to resist temptation, whereas succumbing to temptation signalled to consumers that they have weak willpower (Dhar & Wertenbroch, 2012). Battaglini et al. (2005) also suggest that individuals often attempt to infer their own ability to resist temptations from their past actions, which may in turn affect their subsequent actions.

Thus, recalling past self-control experiences should affect individuals' perceptions regarding their self-control abilities. Writing about past successes should indicate to individuals that they are good at self-control, whereas recalling past failure will tell individuals they are less good at self-control, and thus affect their subsequent choices where self-control is involved.

Furthermore, such a manipulation might influence self-control by increasing the accessibility of mental constructs associated with self-control (vanDellen & Hoyle, 2010). Accessibility is defined as the ease of accessing mental constructs for use in information processing (Danner,

Aarts, & de Vries, 2008). Greater accessibility of self-control constructs is shown to lead to behaviours consistent with those constructs, outside of conscious intention and independently of available mental resources (Fishbach et al., 2003). Thus, the manipulation would increase the regulatory accessibility of the self-control construct, or in other words, "the extent to which individuals might incorporate self-control into information processing" and increase the salience of thoughts related to self-control (vanDellen & Hoyle, 2010, p. 253).

Therefore, writing about how one exerts self-control should lead to increased accessibility of self-control thoughts (thinking about willpower or resisting temptations), which in turn should lead to increased self-control in subsequent decisions. On the other hand, when participants have to write about their lack of self-control, constructs opposite to self-control are activated (e.g., yielding to temptations, acting impulsively), which in turn should lead to decreased self-control ability in subsequent decisions. Importantly, research has indicated that self-assessments about one's abilities are consistent with the recalled content only if recall is easy (Schwarz et al., 1991). As such, this study will require participants to write about two past instances of self-control experiences, following easy recall manipulations utilised by Nikolova et al. (2015), Pham, Lee and Stephen (2012) and Lee, Amir and Ariely (2009).

Finally, the manipulation employed in this study also requires individuals to read about another individual who was or was not able to exercise self-control. This element is designed to strengthen the effects of the manipulation, based on vanDellen and Hoyle's (2010) findings. VanDellen and Hoyle (2010) demonstrate that social factors influence self-control; where reading or thinking about others who chronically exert self-control lead to increased thoughts of self-control and thus increased ability to exercise self-control. This effect is similar to the mimicry effect researched by Chartrand and Bargh (1999), who demonstrate that watching another individual perform a behaviour can automatically influence the watcher to perform the same behaviour. Simply perceiving a behaviour automatically activates mental constructs related to that behaviour (Chartrand & Bargh, 1999). Similarly, reading about another individual who is able to exert self-control should mentally activate constructs related to self-control, increase the mental accessibility of self-control concepts, and thus one's thoughts of self-control, which in turn leads to better self-control (vanDellen & Hoyle, 2010).

3.6.1 Participants

Ninety-one participants were recruited on Amazon Mechanical Turk. Participants were paid $0.80. The free-text responses were examined, and responses with irrelevant content were

eliminated. Eighty-nine[4] viable answers remained. Ages ranged between 21-73 (M = 38.34, SD = 12.61); 43 were female and 46 male. Informed consent was given prior to the experiment, which was approved by the University of St Andrews Ethics Committee. Participants took part in the experiment via the Qualtrics platform. The experiment lasted approximately 8 minutes.

3.6.2 Procedure

Participants were randomly assigned to one of the two conditions: low self-control or high-self-control, in a one-factor (high vs. low-self-control) between-subjects experimental design. Participants completed the experimental manipulation, responded to the manipulation check and completed a set of dependent variables.

In the high self-control condition, participants were shown the following:

> *"In everyday life, people often encounter temptations that conflict with their goals. Self-control is one's ability to overcome temptations and impulses. Someone who has self-control can overcome these obstacles and achieve their goals.*
>
> *For instance, Mary is a person who exercises self-control in several areas of her life. One of Mary's goals is to eat healthily. Although buying a burger and a muffin from the cafe near her office is very tempting, Mary's self-control helps her choose a salad and fruit instead of the tempting alternatives. Similarly, Mary wants to arrive to work on time every morning. Although this is difficult for Mary, her self-control helps her avoid snoozing her alarm in the morning, so that she is on time for work on almost all days. Mary's self-control also helps her with her goal of improving her fitness and going to the gym 3 times a week. After a long day at work, she faces the temptation of going home and watching her favourite TV show. However, when she is faced with this temptation, Mary exercises self-control to overcome it and is quite successful in her aim of going to the gym 3 times a week.*
>
> *Please describe how you are similar to Mary when it comes to at least 2 of your goals. It is essential for the purpose of the study that you provide sufficient detail and write at least 120 words."*

In the low self-control condition, participants were shown the following:

[4] Two participants did not follow the instructions when writing the 120 words.

"*In everyday life, people often encounter temptations that conflict with their goals. Self-control is one's ability to overcome these temptations and impulses. Someone who lacks self-control fails to overcome these obstacles and achieve their goals.*

For instance, Mary is a person who lacks self-control in several areas of her life. One of Mary's goals is to eat healthily. Buying a burger and a muffin from the cafe near her office is very tempting, and although Mary wants to buy a salad instead, she often ends up buying the burger or the muffin due to her lack of self-control. Mary also wants to arrive to work on time every morning. This is difficult for Mary, and because she has little self-control she ends up snoozing her alarm every morning, to the point that she very often gets to work later than she would like to. Mary's lack of self-control also hinders her goal of improving her fitness and going to the gym 3 times a week. After a long day at work, she faces the temptation of going home and watching an episode of her favourite TV show, instead of going to the gym. Due to her lack of self-control, when she is faced with this temptation, Mary succumbs to it and ends up not going to the gym at all.

Please describe how you are similar to Mary when it comes to at least 2 of your goals. It is essential for the purpose of the study that you provide sufficient detail and write at least 120 words."

A manipulation check followed to identify the extent to which the manipulation was successful. The manipulation check assessed individuals' perceptions about their own self-control, using 4 items scored on seven-point scales: "Please rate your current level of self-control" (1 = None, 7 = A great deal); "I possess a great deal of self-control" (1 = Strongly disagree, 7 = Strongly agree); "I don't think I have much self-control" (1 = Strongly disagree, 7 = Strongly agree); "Currently, I feel I can resist temptations and stay on track in achieving my goal" (1 = Strongly disagree, 7 = Strongly agree). The scale had good internal reliability (Cronbach's $\alpha = .95$) and principal component analysis indicated that the 4 items formed a single factor that explained 86.5% of variance.

A modified measure of trait self-control, using six items from Tangney et al.'s (2004) self-control scale was utilised to understand how the manipulation affected individuals' trait self-control scores. These were measured on a five-point scale from 1 ("Not at all") to 5 ("Very much"). The items used were: "I am good at resisting temptation;" "I wish I had more self-discipline;" "I am able to work effectively towards long-term goals;" "Sometimes I can't stop myself from doing something, even if I know it is wrong;" "I often act without thinking through all the alternatives;" "I refuse things that are bad for me." The scale had good internal reliability

(Cronbach's α = .86), and principal component analysis indicated that the six items formed a single factor that explained 58% variance.

3.6.3 Dependent variables

To assess individual's pro-environmental decisions following the manipulation, multiple measures were included.

3.6.3.1 Environmental donation

Participants were provided a scenario, adapted from Bratanova et al. (2012), where they had $100 at their disposal, and they were asked to indicate how much they would donate to an environmental charity. The dependent measure was the amount of money they would be willing to donate. Participants were shown the following text:

> *"Save the Environment is a charity that works to help protect the environment, by tackling a wide range of environmental issues, from reducing the amount of litter on the streets to cutting the carbon emissions that threaten our planet.*
>
> *Suppose you have $100 at your disposal. How much of that would you donate to Save the Environment?"*

3.6.3.2 Recycling decision

The second dependent measure was a fictional self-control scenario. Participants were asked to indicate what decision they would take, faced with the convenient temptation to not recycle a plastic bottle. The measure was rated on a nine-point scale from 1 ("Definitely throw the bottle in the nearby general waste bin") to 9 ("Definitely carry the bottle and recycle it when you encounter a recycling bin"). Participants were shown the following text:

> *"You have just finished drinking a bottle of Coca Cola on your way to the library. You are also carrying a set of large, heavy books that you need to return to the library. There is no recycling bin in sight, but you know that there are bins closer to the library. It would take around 10 minutes to reach the nearest recycling bin, but there is a general waste bin right where you are standing now. Although you want to recycle it, carrying the bottle all the way to the nearest bin would cumbersome, as you are already carrying an uncomfortable load of books. It would be a lot easier to throw the bottle in the general bin and not carry an empty bottle, along with many books, for the rest of your way. What would you do?"*

3.6.3.3 Pro-environmental intentions

A measure of general pro-environmental intentions, adapted from de Leeuw et al. (2015), was used. The measure included two items rated on nine-point scales. The items were: "Do you intend to engage in environmentally-friendly behaviours on a regular basis in the next week?" (1 = Definitely not, 9 = Definitely do); "I am determined to engage in environmentally-friendly behaviours on a regular basis in the next week" (1 = Definitely not, 9 = Yes, definitely). The two items scored together showed good internal reliability (Cronbach's $\alpha = .96$).

3.6.3.4 Likelihood to engage in pro-environmental behaviour

The final measure was the likelihood to engage in pro-environmental behaviour, measured using four items. Participants were asked to indicate, on a seven-point scale from 1 ("Extremely unlikely") to 7 ("Extremely likely") how likely they were to engage in the following behaviours: recycling plastic, buying environmentally-friendly products, saving water by taking shorter showers, and reusing or repairing items instead of throwing them away. The scale showed good reliability, with Cronbach's $\alpha = .79$.

3.6.4 Results

The manipulation check confirmed the manipulation was successful. An independent samples T-test was conducted. Because a Levene Test indicated that the variances were significantly different ($p < .001$) for self-control perceptions, the T-test was based on unequal variances. The T-test revealed that the participants in the low self-control condition reported significantly lower self-control perceptions ($M = 3.79$, $SD = 1.51$) than did those in the high self-control condition ($M = 5.79$, $SD = 0.78$), $t(72.58) = 7.99$, $p < .001$.

The manipulation affected participants' scores on the modified self-control scale similarly. An independent samples T-test revealed that the participants in the low self-control condition scored significantly lower on the self-control scale ($M = 3.02$, $SD = 0.75$) than those in the high self-control condition ($M = 3.87$, $SD = 0.75$), $t(87) = 5.30$, $p < .001$.

To assess the impact of the manipulation on the dependent variables, further independent samples T-tests were conducted on the dependent variables. The means and standard deviations for each dependent variable can be found in Table 16.

Environmental donation: The amount participants indicated they would donate to an environmental charity was significantly affected by the experimental condition. Because a Levene Test indicated that the variances were significantly different, $p < .001$, the T-test was based on unequal variances. Participants in the low self-control condition reported they would donate significantly lower amounts ($M = 9.56$, $SD = 12.85$) than did those in the high self-

control condition (M = 25.76, SD = 27.98), t(54.20) = 3.41, p = .001. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an alpha level of .05, and an effect size d = .744, a power level of 93% was obtained.

Recycling choice: A significant effect of self-control condition on participants' choices in the self-control scenario was found. Participants in the low self-control condition were less likely to choose to recycle the bottle (M = 4.27, SD = 3.19) than were participants in the high self-control condition (M = 6.39, SD = 2.77), t(87) = 3.32, p = .001. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an alpha level of .05, and an effect size d = .709, a power level of 91% was obtained.

Pro-environmental intentions: No significant effect of self-control condition on participants' intention to engage in pro-environmental behaviour was found. Participants in the low self-control condition reported weaker intentions to engage in pro-environmental behaviour (M = 5.70, SD = 2.58) than participants in the high self-control condition (M = 6.57, SD = 2.28), t(87) = 1.68, p = .096. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an alpha level of .05, and an effect size d = .357, a power level of 38% was obtained.

Likelihood to engage in pro-environmental behaviour: A statistically significant effect of self-control condition on participants' likelihood to engage in pro-environmental behaviour was found. Participants in the low self-control condition reported decreased likelihood to engage in pro-environmental behaviour (M = 4.56, SD=1.57), than participants in the high self-control condition (M = 5.24, SD = 1.27), t(87) = 2.21, p = .030. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an alpha level of .05, and an effect size d = .476, a power level of 60% was obtained.

Table 16. Means and standard deviations for the dependent variables in the high and low self-control groups

Condition	Environmental donation (p = .001)		Recycling decision (p = .001)		Environmental intentions (p = .096)		Likelihood to engage in pro-environmental behaviour (p = .030)	
	M	SD	M	SD	M	SD	M	SD
High self-control (N = 41)	25.76	27.98	6.39	2.77	6.57	2.28	5.24	1.27
Low self-control (N = 48)	9.56	12.85	4.27	3.19	5.70	2.58	4.56	1.57

3.6.5 Discussion

Study 4 provides evidence that self-control affects pro-environmental decisions, including donation to an environmental charity, decision to recycle in a hypothetical scenario, increased general intentions to engage in pro-environmental behaviour, and scores on a composite measure of likelihood to engage in a set of pro-environmental behaviours. In the high self-control condition, participants showed a stronger pro-environmental orientation than those in the low self-control condition. They were willing to donate significantly higher amounts and they were significantly more likely to choose the pro-environmental alternative in a self-control scenario. In the high self-control condition, participants also reported significantly higher scores in a composite measure of likelihood to engage in a set of pro-environmental behaviours, than those in the low self-control condition. The effect of self-control on general pro-environmental intentions was not statistically significant, but still in the expected direction, with participants in the high self-control condition reporting higher intentions to engage in pro-environmental behaviour than those in the low self-control condition.

The manipulation used in this study relies on participants reading about another individual who did or did not have self-control, combined with recalling past acts of self-control, both of which

are shown to increase the regulatory accessibility of self-control; when participants are primed with self-control in this manner, they are able to exercise self-control in actions that require it (vanDellen & Hoyle, 2010). Furthermore, the manipulation was expected to have increased or decreased participants' perceptions regarding their own self-control, as indicated by the results of the manipulation check. The findings of this study were consistent with past studies employing similar manipulations (Ein-Gar, 2016), as the manipulation checks indicated participants' perceptions of their own self-control were lower in the low self-control manipulation, and higher in the high self-control manipulation. Similarly, participants in the high self-control condition scored significantly higher on the shortened self-control scale than did those in the low self-control condition. Participants primed with high self-control expressed pro-environmental behavioural tendencies to a higher extent than did those primed with low self-control, suggesting that pro-environmental actions entail a self-control conflict that requires individual self-control ability. In the absence of this, individuals are less likely to act in environmentally-friendly ways.

3.7 Study 5

The previous study revealed that the experimental manipulation of self-control influenced pro-environmental behaviour. However, it did not include a comparison of the two self-control conditions with a neutral control, so it was not clear whether high or low self-control drove the effects obtained. Study 5 thus extends the findings of Study 4 by exploring how the self-control manipulation affects individuals' pro-environmental decisions (H1) compared to a baseline. Additionally, the previous study did not include a measure of environmental attitudes, which are considered to be a key motivation to engage in pro-environmental behaviour (Bamberg, 2003). Self-control is purported to support individuals with existing motivation to engage in a behaviour (Tangney et al., 2004). Therefore, it would be insightful to explore how the self-control manipulation interacts with the general motivation of participants to engage in pro-environmental behaviour. The study will also investigate environmental attitudes, measured using the NEP measure, as in Study 1. This measure was chosen considering the diverse outcome measures in the study. Whilst more specific attitudes are regarded as more suitable for understanding specific behaviours (Bamberg, 2003), in this case different behavioural tendencies are assessed: an environmental donation, a recycling decision and a composite measure of pro-environmental behaviour intentions. The aim was to utilise an attitudinal measure that could be applied across all these outcomes to test H2a, that self-control moderates the relationship between environmental attitudes and behaviour, and H2b, that self-control and attitudes predict behaviour together.

3.7.1 Participants

A total of 251 participants were recruited on Amazon Mechanical Turk. Participants were paid $1.20. The free-text responses were screened, and responses who did not follow the instructions were eliminated. 235[5] viable answers remained. Ages ranged between 20-78 (M = 37.98, SD = 11.84); 136 were female, 97 male, and 2 selected "Other" gender. Informed consent was given prior to the experiment, which was approved by the University of St Andrews Ethics Committee. Participants took part in the experiment via the Qualtrics platform. The experiment lasted approximately 10 minutes.

3.7.2 Procedure

Participants were randomly assigned to one of the three conditions: low self-control, high-self-control, and control. The experimental manipulations for high and low self-control were the same as in the previous study. In the control condition, participants were shown a diagram of a computer, keyboard and monitor, alongside the wiring connecting all the elements[6], and were asked to *"Please describe the diagram below. Please use at least 120 words."*

The manipulation check and measure of trait self-control were the same as in the previous study.

3.7.3 Dependent variables

The same environmental donation and environmental intention measure used in Study 4 were included. The study also included an extended measure of likelihood to engage in pro-environmental behaviour, which included the four items used in Study 4, along with four other behaviours (avoiding eating meat; putting on an extra blanket when cold during the night, instead of turning on the heater; unplugging small appliances when not in use; turning off the lights when leaving the room), measured on a 7-point scale from 1 ("Extremely unlikely") to 7 ("Extremely likely"). The 8-item scale showed good reliability, with Cronbach's $\alpha = .78$.

3.7.4 Environmental attitudes

The 10-item NEP (Clark et al., 2003) utilised in the previous studies was also included as a measure of environmental attitudes.

3.7.5 Results

To test the effects of the self-control manipulations, differences between the three conditions were analysed using ANOVA, followed by planned contrasts. Planned contrasts are suitable for

[5] Sixteen participants did not follow the instructions when writing the 120 words.

[6] The diagram (Happy Kittens, 2010) can be viewed at: https://images-wixmp-ed30a86b8c4ca887773594c2.wixmp.com/intermediary/f/a37e596e-3cac-42c4-979c-41a629e1d3b3/d2y8xn1-4415da21-40cb-41f9-b542-331ef0778f09.png

testing differences between groups predicted in advance (Field, 2018). Based on H1, that self-control positively influences pro-environmental behaviour, it was expected that the high self-control condition would lead to higher scores on the pro-environmental outcomes, compared to the low self-control condition, and compared to the control condition, whereas the low self-control condition was expected to lead to lower scores on the pro-environmental outcomes, compared to the control condition. The same approach was used for the manipulation check, as it was expected that the high self-control condition would lead to higher scores on the manipulation check, compared to the low self-control condition, and compared to the control condition, whereas the low self-control condition was expected to lead to lower scores, compared to the control condition.

To understand whether the manipulation was effective, two one-way ANOVAs were conducted, revealing a statistically significant effect of condition on self-control perceptions ($F(2, 232) = 53.31$, $p < .001$) and on reported trait self-control ($F(2, 232) = 26.71$, $p < .001$).

Planned contrasts revealed a statistically significant difference in self-control perceptions between the low self-control and the high self-control condition ($t(232) = 8.79$, $p < .001$), and between the low-self-control condition and the control condition ($t(232) = -9.07$, $p < .001$). No significant difference was found between the high self-control condition and the control condition ($t(232) = -0.16$, $p = .870$). The manipulation affected participants' scores on the modified self-control scale similarly. An ANOVA revealed that the participants in the low self-control condition scored significantly lower on the self-control scale than did those in the high self-control condition ($t(232) = 6.47$, $p < .001$), and lower than did those in the control condition ($t(232) = -6.17$, $p < .001$). No significant difference was found between the high self-control condition and the control condition ($t(232) = 0.38$, $p = .706$). The means and standard deviations can be seen in Table 17.

Table 17. Mean scores for self-control perceptions and the self-control scale for each condition

Condition	Self-control perceptions		Self-control scale	
	M	SD	M	SD
High self-control (N=76)	5.31	1.10	3.66	0.70
Low self-control (N=79)	3.61	1.32	2.84	0.88
Control (N=80)	5.34	1.18	3.61	0.75

This indicates that although the low self-control manipulation significantly lowered the participants' self-control perceptions relative to the control and the high self-control condition, there was no significant difference between the control and the high self-control condition. One possible explanation is that the control condition did not operate as a neutral control, but rather increased the self-control of the participants. The survey form enabled participants to leave feedback, and some of the qualitative comments indicated that the participants found the task challenging: e.g., "the diagram was very challenging to describe," or "it was a little difficult to figure out." Self-control is needed for challenging or difficult behaviours or tasks, which means that if the task was perceived as challenging, successfully completing the task could increase their beliefs in their own self-control abilities (i.e., sticking to a challenging task and achieving a goal). In turn, these beliefs could have led to subsequent behaviour in line with these beliefs, as recent evidence suggests that positive self-control beliefs can increase self-control behaviour (Hamburg & Pronk, 2015). However, it is unclear whether this was the case, or whether low self-control drove the results. Furthermore, it may be that the manipulation failed to enhance self-control, compared to one's regular self-control, but was only able to lower one's self-control.

Environmental attitudes: A one-way ANOVA indicated that there was no significant difference in NEP scores across the conditions ($F(2, 232) = 1.03$, $p = .359$). Planned contrasts revealed that participants in the low self-control condition did not report significantly lower environmental attitudes than did those in the high self-control condition, $t(232) = 1.40$, $p = .162$. There was no significant difference between the high self-control and the control condition ($t(232) = 0.45$, $p = .652$), nor between the low self-control and the control condition ($t(232) = - 0.96$, $p = .337$). This suggests that the participants exhibited similar levels of environmental attitudes across the three conditions. Descriptives can be seen in Table 18.

Environmental donation: A one-way ANOVA was conducted to test H1, that self-control influences pro-environmental behaviour. The amount participants indicated they would donate to an environmental charity was not significantly affected by the experimental condition, $F(2, 232) = 2.498$, $p = .084$.

Participants in the low self-control condition reported they would donate significantly lower amounts than did those in the high self-control condition, $t(232) = 2.209$, $p = .028$. There was no significant difference between the high self-control and the control condition ($t(232) = 1.423$, $p = .156$), nor between the low self-control and the control condition ($t(232) = -0.801$, $p = .424$).

Post-hoc power analyses using G*Power 3 (Faul et al., 2007) revealed that, with an alpha level of .05, and effect sizes $f = .146$, $f = .095$ and $f = .055$, power levels of 61%, 31% and 13% were

obtained for the contrasts between the high self-control and the low self-control condition, between the high self-control and the control condition, and between the low self-control and the control condition, respectively.

Descriptives can be seen in Table 18.

Table 18. Descriptives for each outcome measure by condition

Condition	Environmental attitudes		Environmental donation		Recycling decision		Pro-environmental intentions		Likelihood to engage in behaviour	
	M	SD	M	SD	M	SD	M	SD	M	SD
Control (N=80)	3.70	0.84	16.24	21.75	5.21	3.07	6.29	2.33	4.99	1.06
High self-control (N=76)	3.56	0.83	21.18	24.73	5.58	3.26	6.38	2.28	4.99	1.07
Low self-control (N=79)	3.76	0.98	13.48	18.29	4.86	3.17	5.72	2.37	4.54	1.19

The two alternative hypotheses were explored (H2a and H2b). Only the high and low self-control conditions were included in the exploration of these hypotheses, as it was unclear what level of self-control individuals in the control condition exhibited. The control condition in this case did not provide a middle point for self-control levels, as there were no significant differences in self-control perceptions, or in scores on the modified self-control scale, between the high self-control condition, and the control condition. As such, only the high and low self-control levels were included, which were significantly different in self-control perceptions, and in scores on the modified self-control scale, and would thus provide more useful information for analysis. The aim was to understand whether high or low levels of self-control moderate the relationship between environmental attitudes and pro-environmental behaviour (H2a) or whether high or low levels of self-control, and environmental attitudes, predict pro-environmental behaviour together (H2b).

To test H2a, a moderation analysis using the PROCESS macro (Hayes, 2018) was conducted (Model 1, 5000 bootstrap re-samples, variables were not mean centred). The moderation analysis indicated no statistically significant interaction between attitudes and experimental

condition, b = 2.30, 95% CI [-5.090, 9.697], p = .539. The regression coefficients for the moderation analysis can be seen in Table 19. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an effect size $f^2 = .003$, and an alpha level of .05, a power level of 10% was obtained for detecting the contribution of the interaction to the model.

Table 19. Summary of multiple regression for moderation analysis

	b	SE B	t	p
NEP	6.52	2.39	-1.11	p = .007
Condition	-2.26	14.16	-0.16	p = .874
Condition x NEP	2.30	3.74	0.62	p = .539

Note. Fit for model $R^2 = .13$, $F(3, 151) = 7.41$, $p = .001$

To test H2b, a two-step hierarchical regression was conducted with donation as the dependent variable. Environmental attitudes (NEP) were entered at Step One of the regression, and self-control was entered at Step Two. The hierarchical regression revealed that at Step One, NEP contributed significantly to the regression model, $F(1, 153) = 18.18$, $p < .001$, and accounted for 11% of the variation in environmental donation. In Step Two, the two predictors explained 13% of the variance, ($R^2 = .13$, $F(2, 152) = 10.97$, $p < .001$). NEP ($\beta = .31$, $p < .001$) was a statistically significant predictor, and condition was a non-significant predictor ($\beta = .14$, $p = .065$). Adding condition to the regression model explained an additional 2% of the variation in environmental donation, and this change in R^2 was not statistically significant ($p = .065$). A summary of the regression analysis can be seen in Table 20. A post-hoc power analysis using G*Power 3 (Faul et al., 2007), showed that, with an alpha level of .05, and an effect size $f^2 = .023$, a power level of 47% was obtained for detecting the increase in variance explained by adding condition to the model.

Table 20. Summary of hierarchical regression analysis for variables predicting environmental donation

	B	SE B	β	R^2	ΔR^2
Step 1				0.11	0.11**
NEP	7.84	1.84	0.33**		
Step 2				0.13	0.02†
NEP	7.46	1.83	0.31**		
Condition	6.21	3.34	0.14†		

†p < 0.10, *p < .05, **p < .01

Recycling choice: To test H1, a one-way ANOVA indicated that individuals' choices whether to recycle the bottle or not were not significantly affected by the experimental condition ($F(2, 232) = 0.10$, $p = .371$). Planned contrasts revealed no significant differences between the low self-control condition and the high self-control condition, $t(232) = 1.41$, $p = .160$. There was no significant difference between the high self-control and the control condition ($t(232) = 0.72$, $p = .471$), nor between the low self-control and the control condition ($t(232) = -0.70$, $p = .485$). However, as it can be seen in Table 18, the general trends were consistent with the environmental donation measure, as the means indicated that participants in the low self-control condition were less likely to choose to recycle the bottle than were the participants in the high self-control condition. Post-hoc power analyses using G*Power 3 (Faul et al., 2007) revealed that, with an alpha level of .05, and effect sizes $f = .095$, $f = .044$ and $f = .044$, power levels of 31%, 11% and 11% were obtained for the contrasts between the high self-control and the low self-control condition, between the high self-control and the control condition, and between the low self-control and the control condition, respectively.

To test H2a, a moderation analysis using the PROCESS macro (Hayes, 2018) was conducted (Model 1, 5000 bootstrap re-samples, variables were not mean centred). The moderation analysis indicated no significant interaction between attitudes and experimental condition, $b = 1.01$, 95% CI [-0.049, 2.072], $p = .061$. The regression coefficients for the moderation analysis can be seen in Table 21. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an effect size $f^2 = .023$, and an alpha level of .05, a power level of 47% was obtained for detecting the contribution of the interaction to the model.

Table 21. Summary of multiple regression for moderation analysis

	b	SE B	t	p
NEP	0.91	0.34	2.66	p = .009
Condition	-3.27	2.03	-1.61	p = .110
Condition x NEP	1.01	0.54	1.88	p = .061

Note. Fit for model $R^2 = .17$, $F(3, 151) = 10.32$, $p < .001$

To test H2b, a two-step hierarchical regression was conducted with recycling choice as the dependent variable. Environmental attitudes (NEP) were entered at Step One of the regression, and self-control was entered at Step Two. The hierarchical regression revealed that at Step One, NEP contributed significantly to the regression model, $F(1,153) = 26.08$, $p < .001$, and accounted for 14.6% of the variation in recycling choice. In Step Two, the two predictors explained 15.1% of the variance, ($R^2 = .151$, $F(2, 152) = 13.47$, $p < .001$). NEP ($\beta = .37$, $p < .001$) was a statistically significant predictor, whereas condition was not a statistically significant predictor ($\beta = .07$, $p = .349$). Adding condition to the regression model explained an additional 0.5% of the variation in recycling choice, and this change in R^2 was not statistically significant ($p = .349$). A summary of the regression analysis can be seen in Table 22. A post-hoc power analysis using G*Power 3 (Faul et al., 2007), showed that, with an alpha level of .05, and an effect size $f^2 = .006$, a power level of 16% was obtained for detecting the increase in variance explained by adding condition to the model.

Table 22. Summary of hierarchical regression analysis for variables predicting recycling decision

	B	SE B	β	R^2	ΔR^2
Step 1				0.146	0.146**
NEP	1.35	0.26	0.38**		
Step 2				0.151	0.005^{ns}
NEP	1.32	0.27	0.37**		
Condition	0.45	0.48	0.07^{ns}		

$^{ns}p > 0.10$, $^{\dagger}p < 0.10$, *p < .05, **p < .01

Pro-environmental intentions: To explore H1, a one-way ANOVA was conducted and indicated that individuals' pro-environmental intentions were not significantly affected by the experimental condition ($F(2, 232) = 1.84$, $p = .161$). Planned contrasts revealed that participants in the low self-control condition reported fewer intentions to engage in pro-environmental behaviour than participants in the high self-control condition, a finding which was not significant, $t(232) = 1.77$, $p = .079$. There was no significant difference between the high self-control and the control condition ($t(232) = 0.25$, $p = .801$), nor between the low self-control and the control condition ($t(232) = -1.53$, $p = .127$). Descriptives can be seen in Table 18. Post-hoc power analyses using G*Power 3 (Faul et al., 2007) revealed that, with an alpha level of .05, and effect sizes $f = .115$, $f = .017$ and $f = .010$, power levels of 42%, 6% and 33% were obtained for the contrasts between the high self-control and the low self-control condition, between the high self-control and the control condition, and between the low self-control and the control condition, respectively.

To explore H2a, a moderation analysis using the PROCESS macro (Hayes, 2018) was conducted (Model 1, 5000 bootstrap re-samples, variables were not mean centred). The moderation analysis indicated no significant interaction between attitudes and experimental condition, $b = 0.35$, 95% CI [-0.356, 1.051], $p = .331$. The regression coefficients for the moderation analysis can be seen in Table 23. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an effect size $f^2 = .006$, and an alpha level of .05, a power level of 16% was obtained for detecting the contribution of the interaction to the model.

Table 23. Summary of multiple regression for moderation analysis

	b	SE B	t	p
NEP	1.23	0.23	5.41	$p < .001$
Condition	-0.89	1.35	-0.66	$p = .510$
Condition x NEP	0.35	0.36	0.98	$p = .331$

Note. Fit for model $R^2 = .31$, $F(3, 151) = 22.16$, $p < .001$

To test H2b, a two-step hierarchical regression was conducted with pro-environmental intentions as the dependent variable. Environmental attitudes (NEP) were entered at Step One of the regression, and self-control was entered at Step Two. The hierarchical regression revealed that, at Step One, NEP contributed significantly to the regression model, $F(1, 153) = 63.89$, $p < .001$, and accounted for 29.5% of the variation in pro-environmental intentions. At Step Two, the two predictors explained 30.1% of the variance, ($R^2 = .301$, $F(2, 152) = 32.78$, $p < .001$).

NEP (β = 0.53, p <.001) was a statistically significant predictor, whereas condition was not a statistically significant predictor (β = .08, p = .226). Adding self-control condition to the regression model explained an additional 0.7% of the variation in pro-environmental intentions, and this change in R^2 was not statistically significant (p = .226). A summary of the regression analysis can be seen in Table 24. A post-hoc power analysis using G*Power 3 (Faul et al., 2007), showed that, with an alpha level of .05, and an effect size $f^2 = .010$, a power level of 24% was obtained for detecting the increase in variance explained by adding condition to the model.

Table 24. Summary of hierarchical regression analysis for variables predicting pro-environmental intentions

	B	SE B	β	R^2	ΔR^2
Step 1				0.295	0.295**
NEP	1.39	0.17	0.54**		
Step 2				0.301	0.007^{ns}
NEP	1.37	0.18	0.53**		
Condition	0.39	0.32	0.08^{ns}		

$^{ns}p > 0.10$, $^{\dagger}p < 0.10$, *p < .05, **p < .01

Likelihood to engage in pro-environmental behaviour: To explore H1, a one-way ANOVA was conducted. A statistically significant effect of condition on participants' likelihood to engage in pro-environmental behaviour was found (F(2, 232) = 4.27, p = .015.

Planned contrasts revealed that participants in the low self-control condition reported significantly lower likelihood to engage in pro-environmental behaviour than participants in the high self-control condition, t(232) = 2.50, p = .013. There was also a significant difference between the low self-control and the control condition (t(232) = -2.56, p = .011), but no difference between the high self-control and the control condition (t(232) = -0.03, p = .976.

Post-hoc power analyses using G*Power 3 (Faul et al., 2007) revealed that, with an alpha level of .05, and effect sizes f = .163, f = .002 and f = .167, power levels of 70%, 5% and 72% were obtained for the contrasts between the high self-control and the low self-control condition, between the high self-control and the control condition, and between the low self-control and the control condition, respectively.

To test H2a, a moderation analysis using the PROCESS macro (Hayes, 2018) was conducted (Model 1, 5000 bootstrap re-samples, variables were not mean centred). The moderation analysis indicated no significant interaction between attitudes and experimental condition, b = 0.08, 95% CI [-0.286, 0.445], p = .668. The regression coefficients for the moderation analysis can be seen in Table 25. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an effect size f^2 = .001, and an alpha level of .05, a power level of 7% was obtained for detecting the contribution of the interaction to the model.

Table 25. Summary of multiple regression for moderation analysis

	b	SE B	t	p
NEP	0.52	0.12	4.39	p < .001
Condition	0.04	0.70	0.06	p = .952
Condition x NEP	0.08	0.19	0.43	p = .668

Note. Fit for model R^2 = .23, F(3, 151) = 14.73, p < .001

To test H2b, a two-step hierarchical regression was conducted with likelihood to engage in pro-environmental behaviour as the dependent variable. Environmental attitudes (NEP) were entered at Step One of the regression, and self-control was entered at Step Two. The hierarchical regression revealed that at Step One, NEP contributed significantly to the regression model, F(1, 153) = 39.32, p < .001, and accounted for 20.4% of the variation in likelihood to engage in pro-environmental behaviour. In Step Two, the two predictors explained 22.5% of the variance, (R^2 = .225, F(2, 152) = 22.122, p < .001). NEP (β = .44, p < .001) was a statistically significant predictor, and condition was also a statistically significant predictor (β = .15, p = .044). Adding self-control to the regression model explained an additional 2.1% of the variation in likelihood to engage in pro-environmental behaviour, and this change in R^2 was significant (p = .044). A summary of the regression analysis can be seen in Table 26. A post-hoc power analysis using G*Power 3 (Faul et al., 2007), showed that, with an alpha level of .05, and an effect size f^2 = .027, a power level of 53% was obtained for detecting the increase in variance explained by adding condition to the model.

Table 26. Summary of hierarchical regression analysis for variables predicting likelihood to engage in pro-environmental behaviour

	B	SE B	β	R^2	ΔR^2
Step 1				0.204	0.204**
NEP	0.57	0.09	0.45**		
Step 2				0.225	0.021**
NEP	0.55	0.09	0.44**		
Condition	0.33	0.17	0.15**		

$^{ns}p > 0.10$, $^{\dagger}p < 0.10$, *p < .05, **p < .01

3.7.6 Discussion

Study 5 provides additional evidence that self-control influences pro-environmental behaviour. The high self-control condition led to higher scores on the environmental outcomes, compared to the low self-control condition, consistent with the previous studies. Although one of the aims was for the experiment to help better understand the effectiveness of the manipulations compared to a control, in this case the control condition may not have worked as intended, considering the lack of significant differences between the high self-control and the control condition as regards self-control perceptions, scores on the modified self-control scale, and the environmental outcome measures. One possible explanation for this may be that the task in the control condition may have bolstered participants' self-control perceptions. The qualitative comments recorded at the end of the survey indicated that participants found the task challenging. Self-control is needed for challenging tasks, which means that if the task was indeed challenging, participants would have had to exercise self-control to write 120 words about the diagram. Successfully completing the task could increase their perception of their own self-control, by persisting and completing a difficult task, which could have in turn improved their subsequent self-control performance or signalled high self-control to the participants (Dhar & Wertenbroch, 2012; Hamburg & Pronk, 2015). However, another possibility is that low self-control drove the effects obtained in this study, whereas the high self-control manipulation may have not significantly enhanced self-control, compared to one's regular self-control. Given that past research that manipulated self-control situationally by priming high or low self-control did not include a neutral control (Ein-Gar, 2015; Ein-Gar & Steinhart, 2017; Nikolova et al., 2015), it is not clear how this manipulation affects behaviour, relative to a control condition.

Participants in the high self-control condition reported significantly higher scores on a composite measure of likelihood to engage in pro-environmental behaviour, and on an environmental donation measure, than did those in the low self-control condition. While the effects were not significant for the recycling decision and for the general pro-environmental intention measure, they were still in the expected direction, consistent with Study 4. When comparing the means for the high and low self-control condition, participants in the high self-control condition reported higher scores on the recycling decision and the general pro-environmental intention measure than participants in the low self-control condition, exhibiting a consistent pattern of results that suggests that higher levels of self-control are associated with more engagement in pro-environmental behaviour, whereas lower levels of self-control are associated with less pro-environmental behaviour. The findings of this experiment thus add support the causal role of self-control in pro-environmental behaviour, supporting H1.

Additional analyses were conducted to test H2a and H2b, to understand the role of self-control in conjunction with general environmental attitudes. For all the outcome measures in this study, self-control did not moderate the relationship between attitudes and behaviour; there is no evidence that attitudes are more strongly associated with behaviour for high self-control. Therefore, similar to Studies 1, 2 and 3, H2a was not supported.

Self-control and attitudes were shown to be independent predictors, consistent with Studies 1, 2 and 3, for the likelihood to engage in pro-environmental behaviour, supporting H2b. However, the results for the recycling decision, environmental donation, and general intentions to engage in environmentally-friendly behaviour were not significant. The effect sizes for detecting the increase in variance due to adding condition to the regression model were similar to or smaller than the effect sizes obtained for adding self-control to the regression model in Studies 1, 2 and 3 ($f^2 = .023$ for the meta-analysis for Studies 1, 2 and 3; $f^2 = .023$ for the environmental donation and $f^2 = .010$ for general pro-environmental intentions in the current study). In this study, lower statistical power than the conventional 80% (Cohen, 1988) was achieved for these measures, which may have affected the detection of significant results. Nonetheless, the pattern of results from Studies 1, 2, 3 and 5 provides support for H2b, thus suggesting that both self-control and motivation predict behaviour.

3.8 Study 6

The previous studies revealed that the experimental manipulation of self-control influenced pro-environmental behaviour. Study 5 aimed to explore the high and low self-control manipulations in comparison to a neutral control, to ascertain whether high or low self-control drove the

effects obtained in Study 4. It was not clear whether the task used for the control condition used in Study 5 led to participants' perceptions regarding their own self-control being increased, or whether low self-control drove the effects obtained. Therefore, Study 6 extends the findings of Study 5 by exploring the effects of the self-control manipulation on pro-environmental tendencies (H1) in comparison to a different control condition. In this case, the task used in the control condition was based on other manipulations used in order to maintain current levels of situational self-control (assumed to be at an average level), where participants were asked to describe recent events (Schmeichel, 2007; Sevincer, Schlier, & Oettingen, 2015). The study will also investigate environmental attitudes, measured using the NEP measure, as in Study 5, to explore the alternative hypotheses, H2a and H2b.

3.8.1 Participants

A total of 318 participants were recruited on Amazon Mechanical Turk. Participants were paid $1. The free-text responses were screened, and responses who did not follow the instructions were eliminated. 305[7] viable answers remained. Ages ranged between 19-72 (M = 38.17, SD = 12.23); 153 were female and 152 male. Informed consent was given prior to the experiment, which was approved by the University of St Andrews Ethics Committee. Participants took part in the experiment via the Qualtrics platform. The experiment lasted approximately 10 minutes.

3.8.2 Procedure

Participants were randomly assigned to one of the three conditions: low self-control, high-self-control, and control. The experimental manipulations for high and low self-control were the same as in Studies 4 and 5. In the control condition, participants were asked the following:

> *Please describe what you have done in the last 24 hours. It is essential for the purpose of the study that you provide sufficient detail and write at least 120 words.*

The manipulation check and measure of trait self-control were the same as in the previous study.

3.8.3 Dependent variables

The same environmental donation, environmental decision, environmental intention measure and likelihood to engage in pro-environmental behaviour used in Study 5 were included.

3.8.4 Environmental attitudes

The 10-item NEP (Clark et al., 2003) utilised in the previous studies was also included as a measure of environmental attitudes.

[7] 13 participants did not follow the instructions when writing the 120 words.

3.8.5 Results

To understand whether the manipulation was effective, two one-way ANOVAs were conducted, revealing a statistically significant effect of condition on self-control perceptions ($F(2, 302) = 69.73$, $p < .001$) and on reported trait self-control ($F(2, 302) = 56.58$, $p < .001$).

Planned contrasts revealed a statistically significant difference in self-control perceptions between the low self-control and the high self-control condition ($t(302) = 10.19$, $p < .001$), and between the low-self-control condition and the control condition ($t(302) = -10.37$, $p < .001$). No significant difference was found between the high self-control condition and the control condition ($t(302) = -0.43$, $p = .669$). The manipulation affected participants' scores on the modified self-control scale similarly. An ANOVA revealed that the participants in the low self-control condition scored significantly lower on the self-control scale than did those in the high self-control condition ($t(302) = 9.56$, $p < .001$), and lower than did those in the control condition ($t(302) = -8.94$, $p < .001$). No significant difference was found between the high self-control condition and the control condition ($t(302) = 0.41$, $p = .679$). The descriptives can be found in Table 27.

Table 27. Mean scores for self-control perceptions and the self-control scale for each condition

Condition	Self-control perceptions		Self-control scale	
	M	SD	M	SD
High self-control (N = 109)	5.42	1.24	3.86	0.78
Low self-control (N = 97)	3.56	1.45	2.82	0.83
Control (N = 99)	5.50	1.23	3.81	0.72

Similar to Study 5, these findings indicate that although the low self-control manipulation significantly lowered the participants' self-control perceptions relative to the control and the high self-control condition, there was no significant difference between the control and the high self-control condition. This suggests that low self-control may be driving the effects, and that the high self-control condition may not have enhanced self-control relative to individuals' average self-control levels.

Environmental attitudes: A one-way ANOVA indicated that there was no significant difference in NEP scores across the three groups ($F(2, 302) = 2.95$, $p = .055$). Planned contrasts revealed that participants in the low self-control condition did not report significantly lower

environmental attitudes than did those in the high self-control condition, t(302) = 0.70, p = .484. There was a significant difference between the high self-control and the control condition (t(302) = 2.37, p = .018), but no significant difference between the low self-control and the control condition (t(302) = 1.62, p = .106). Descriptives can be seen in Table 28.

Environmental donation: To test H1, a one-way ANOVA was conducted, and revealed no significant effects of condition on the amount participants indicated they would donate to an environmental charity, F(2, 302) = 0.78, p = .458. Planned contrasts revealed no significant differences between the high self-control and the low self-control condition (t(302) = 1.25, p = .212), between the high self-control and the control condition (t(302) = 0.59, p = .558), nor between the low self-control and the control condition (t(302) = - 0.653, p = .515). However, consistent with the findings from Studies 4 and 5, participants in the low self-control condition reported they would donate lower amounts than did those in the high self-control condition. Descriptives can be seen in Table 28. Post-hoc power analyses using G*Power 3 (Faul et al., 2007) revealed that, with an alpha level of .05, and effect sizes f = .071, f = .032 and f = .032, power levels of 23%, 9% and 9% were obtained for the contrasts between the high self-control and the low self-control condition, between the high self-control and the control condition, and between the low self-control and the control condition, respectively.

Table 28. Descriptives for each outcome measure by condition

Condition	Environmental attitudes		Environmental donation		Recycling decision		Pro-environmental intentions		Likelihood to engage in behaviour	
	M	SD	M	SD	M	SD	M	SD	M	SD
Control (N=99)	3.49	0.75	20.52	24.14	5.56	3.13	6.44	2.37	4.94	1.20
High self-control (N=109)	3.76	0.85	22.47	24.20	5.94	3.14	6.78	2.11	5.14	1.11
Low self-control (N=97)	3.68	0.90	18.28	23.61	4.93	3.28	5.91	2.56	4.67	1.26

The two alternative hypotheses were explored. As in Study 5, considering the lack of a meaningful middle point between high and low self-control, only the high and low self-control conditions were included in the exploration of these hypotheses, to understand whether high or

low levels of self-control moderate the relationship between environmental attitudes and pro-environmental behaviour (H2a) or whether high or low levels of self-control, and environmental attitudes, predict pro-environmental behaviour together (H2b).

The moderating role of attitudes was explored. Moderation analysis using the PROCESS macro (Hayes, 2018; Model 1, 5000 bootstrap re-samples, variables were not mean centred) indicated no statistically significant interaction between attitudes and experimental condition, b = 6.06, 95% CI [-1.283, 13.395], p = .105. The regression coefficients for the moderation analysis can be seen in Table 29. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an effect size f^2 = .013, and an alpha level of .05, a power level of 37% was obtained for detecting the contribution of the interaction to the model.

Table 29. Summary of multiple regression for moderation analysis

	b	SE B	t	p
NEP	3.35	2.63	1.27	p = .204
Condition	-18.88	14.23	-1.33	p = .186
Condition x NEP	6.06	3.72	1.63	p = .105

Note. Fit for model R^2 = .07, F(3, 202) = 5.34, p = .002

To test H2b, a two-step hierarchical regression was conducted with donation as the dependent variable. Environmental attitudes (NEP) were entered at Step One of the regression, and self-control was entered at Step Two. The hierarchical regression revealed that at Step One, NEP contributed significantly to the regression model, F(1, 204) = 11.99, p = .001, and accounted for 5.6% of the variation in environmental donation. In Step Two, the two predictors explained 6.1% of the variance, (R^2 = 0.061, F(2, 203) = 6.64, p = .002). NEP (β = .23, p = .001) was a statistically significant predictor, and condition was not a significant predictor (β = .08, p = .262). Adding condition to the regression model explained an additional 0.6% of the variation in environmental donation, and this change in R^2 was not significant (p = .262). A summary of the regression analysis can be seen in Table 30. A post-hoc power analysis using G*Power 3 (Faul et al., 2007), showed that, with an alpha level of .05, and an effect size f^2 = .006, a power level of 20% was obtained for detecting the increase in variance explained by adding condition to the model.

Table 30. Summary of hierarchical regression analysis for variables predicting environmental donation

	B	SE B	β	R^2	ΔR^2
Step 1				0.056	0.056**
NEP	6.47	1.87	0.24**		
Step 2				0.061	0.006^{ns}
NEP	6.37	1.87	0.23**		
Condition	3.67	3.26	0.08^{ns}		

$^{\dagger}p < 0.10$, *p < .05, **p < .01

Recycling choice: To explore H1, a one-way ANOVA was conducted; the ANOVA indicated no significant effect of condition on individuals' choices whether to recycle the bottle or not ($F(2, 302) = 2.61$, $p = .076$). Planned contrasts revealed a significant difference between the low self-control condition and the high self-control condition, $t(302) = 2.27$, $p = .024$. There was no significant difference between the high self-control and the control condition ($t(232) = 0.86$, $p = .390$), nor between the low self-control and the control condition ($t(232) = -1.38$, $p = .168$). Post-hoc power analyses using G*Power 3 (Faul et al., 2007) revealed that, with an alpha level of .05, and effect sizes f = .132, f = .045 and f = .077, power levels of 63%, 12% and 27% were obtained for the contrasts between the high self-control and the low self-control condition, between the high self-control and the control condition, and between the low self-control and the control condition, respectively.

To test H2a, a moderation analysis using the PROCESS macro (Hayes, 2018) was conducted (Model 1, 5000 bootstrap re-samples, variables were not mean centred). No statistically significant interaction between attitudes and experimental condition was found, b = -0.07, 95% CI [-1.038, 0.904], p = .892. The regression coefficients for the moderation analysis can be seen in Table 31. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an effect size $f^2 = .00001$, and an alpha level of .05, a power level of 5% was obtained for detecting the contribution of the interaction to the model.

Table 31. Summary of multiple regression for moderation analysis

	b	SE B	t	p
NEP	1.12	0.35	3.23	p = .001
Condition	1.17	1.88	0.62	p = .536
Condition x NEP	-0.07	0.49	-0.14	p = .892

Note. Fit for model $R^2 = .11$, $F(3, 202) = 8.39$, $p < .001$

To test H2b, two-step hierarchical regression was conducted with recycling choice as the dependent variable. Environmental attitudes (NEP) were entered at Step One of the regression, and self-control was entered at Step Two. The hierarchical regression revealed that at Step One, NEP contributed significantly to the regression model, $F(1, 204) = 20.33$, $p < .001$, and accounted for 9% of the variation in recycling choice. In Step Two, the two predictors explained 11% of the variance, ($R^2 = 0.11$, $F(2, 203) = 12.64$, $p < .001$). NEP ($\beta = .29$, $p < .001$) was a statistically significant predictor, and condition was a statistically significant predictor ($\beta = .14$, $p = .033$). Adding condition to the regression model explained an additional 2% of the variation in recycling choice, and this change in R^2 was statistically significant ($p = .033$). A summary of the regression analysis can be seen in Table 32. A post-hoc power analysis using G*Power 3 (Faul et al., 2007), showed that, with an alpha level of .05, and an effect size $f^2 = .022$, a power level of 56% was obtained for detecting the increase in variance explained by adding condition to the model.

Table 32. Summary of hierarchical regression analysis for variables predicting recycling choice

	B	SE B	β	R^2	ΔR^2
Step 1				0.09	0.09**
NEP	1.12	0.25	0.30**		
Step 2				0.11	0.02**
NEP	1.09	0.25	0.29**		
Condition	0.92	0.43	0.14**		

$^{\dagger}p < 0.10$, *p < .05, **p < .01

Pro-environmental intentions: A one-way ANOVA indicated a statistically significant effect of condition on individuals' pro-environmental intentions ($F(2, 302) = 3.58$, $p = .029$). Planned

contrasts revealed that participants in the low self-control condition reported significantly weaker intentions to engage in pro-environmental behaviour than participants in the high self-control condition, t(302) = 2.66, p = .008. There was no significant difference between the high self-control and the control condition (t(302) = 1.05, p = .297), nor between the low self-control and the control condition (t(232) = -1.59, p = .114). Descriptives can be seen in Table 28. Post-hoc power analyses using G*Power 3 (Faul et al., 2007) revealed that, with an alpha level of .05, and effect sizes f = .153, f = .063 and f = .089, power levels of 76%, 19% and 35% were obtained for the contrasts between the high self-control and the low self-control condition, between the high self-control and the control condition, and between the low self-control and the control condition, respectively.

To test H2a, a moderation analysis using the PROCESS macro (Hayes, 2018) was conducted (Model 1, 5000 bootstrap re-samples, variables were not mean centred). No statistically significant interaction between attitudes and experimental condition was found, b = 0.03, 95% CI [-0.630, 0.689], p = .930. The regression coefficients for the moderation analysis can be seen in Table 33. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an effect size f^2 = .00004, and an alpha level of .05, a power level of 5% was obtained for detecting the contribution of the interaction to the model.

Table 33. Summary of multiple regression for moderation analysis

	b	SE B	t	p
NEP	1.20	0.24	5.08	p < .001
Condition	0.66	1.28	0.52	p = .605
Condition x NEP	0.03	0.33	0.09	p = .930

Note. Fit for model R^2 = .23, F(3, 202) = 20.59, p < .001

To test H2b, a two-step hierarchical regression was conducted with pro-environmental intentions as the dependent variable. Environmental attitudes (NEP) were entered at Step One of the regression, and self-control was entered at Step Two. The hierarchical regression revealed that at Step One, NEP contributed significantly to the regression model, F(1, 204) = 54.44, p < .001, and accounted for 20.8% of the variation in pro-environmental intentions. In Step Two, the two predictors explained 23.4% of the variance, (R^2 = 0.23, F(2, 203) = 31.04, p < .001). NEP (β = .45, p < .001) was a statistically significant predictor, and condition was a statistically significant predictor (β = .16, p = .009). Adding condition to the regression model explained an additional 2.7% of the variation in pro-environmental intentions, and this change in R^2 was

statistically significant (p = .009). A summary of the regression analysis can be seen in Table 34. A post-hoc power analysis using G*Power 3 (Faul et al., 2007), showed that, with an alpha level of .05, and an effect size f^2 = .035, a power level of 76% was obtained for detecting the increase in variance explained by adding condition to the model.

Table 34. Summary of hierarchical regression analysis for variables predicting pro-environmental intentions

	B	SE B	β	R^2	ΔR^2
Step 1				0.208	0.208**
NEP	1.24	0.17	0.46**		
Step 2				0.234	0.027**
NEP	1.22	0.17	0.45**		
Condition	0.77	0.29	0.16**		

$^{\dagger}p < 0.10$, *p < .05, **p < .01

Likelihood to engage in pro-environmental behaviour: A statistically significant effect of condition on participants' likelihood to engage in pro-environmental behaviour was found (F(2, 302) = 4.10, p = .017. Planned contrasts revealed that participants in the low self-control condition reported significantly lower likelihood to engage in pro-environmental behaviour than participants in the high self-control condition, t(302) = 2.86, p = .005. There was also no significant difference between the high self-control and the control condition (t(302) = 1.26, p = .209), nor between the low self-control and the control condition (t(232) = -1.57, p = .117. Post-hoc power analyses using G*Power 3 (Faul et al., 2007) revealed that, with an alpha level of .05, and effect sizes f = .163, f = .070 and f = .089, power levels of 81%, 23% and 35% were obtained for the contrasts between the high self-control and the low self-control condition, between the high self-control and the control condition, and between the low self-control and the control condition, respectively.

To test H2a, a moderation analysis using the PROCESS macro (Hayes, 2018) was conducted (Model 1, 5000 bootstrap re-samples, variables were not mean centred). No statistically significant interaction between attitudes and experimental condition was found, b = 0.06, 95% CI [-0.279, 0.398], p = .730. The regression coefficients for the moderation analysis can be seen in Table 35. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an effect size f^2 = .0006, and an alpha level of .05, a power level of 6% was obtained for detecting the contribution of the interaction to the model.

Table 35. Summary of multiple regression for moderation analysis

	b	SE B	t	p
NEP	0.56	0.12	4.60	p < .001
Condition	0.21	0.66	0.31	p = .755
Condition x NEP	0.06	0.17	0.35	p = .730

Note. Fit for model $R^2 = .22$, $F(3, 202) = 19.03$, $p < .001$

To test H2b, a two-step hierarchical regression was conducted with likelihood to engage in pro-environmental behaviour as the dependent variable. Environmental attitudes (NEP) were entered at Step One of the regression, and self-control was entered at Step Two. The hierarchical regression revealed that at Step One, NEP contributed significantly to the regression model, $F(1, 204) = 47.40$, $p < .001$, and accounted for 19% of the variation in likelihood to engage in pro-environmental behaviour. In Step Two, the two predictors explained 23% of the variance, ($R^2 = 0.23$, $F(2, 203) = 28.60$, $p < .001$). NEP ($\beta = .43$, $p < .001$) was a statistically significant predictor, and condition was a statistically significant predictor ($\beta = .18$, $p = .005$). Adding condition to the regression model explained an additional 3% of the variation in likelihood to engage in pro-environmental behaviour, and this change in R^2 was statistically significant ($p = .005$). A summary of the regression analysis can be seen in Table 36. A post-hoc power analysis using G*Power 3 (Faul et al., 2007), showed that, with an alpha level of .05, and an effect size $f^2 = .038$, a power level of 80% was obtained for detecting the increase in variance explained by adding condition to the model.

Table 36. Summary of hierarchical regression analysis for variables predicting likelihood to engage in pro-environmental behaviour

	B	SE B	β	R^2	ΔR^2
Step 1				0.19	0.19**
NEP	0.60	0.09	0.43**		
Step 2				0.22	0.03**
NEP	0.59	0.09	0.43**		
Condition	0.43	0.15	0.18**		

$^{\dagger}p < 0.10$, *p < .05, **p < .01

3.8.6 Meta-analysis

Overall, the main effect of condition over the behaviours across Studies 4, 5 and 6 was consistent, although there are discrepancies the statistical significance of the effects of self-control condition over the various outcome measures. While in Study 4 condition significantly affected the environmental donation measure, this was not the case in Study 6, but was replicated in Study 5. Similarly, condition significantly affected the hypothetical recycling decision in Studies 4 and 6, but not in Study 5. Several of the tests in Studies 4, 5 and 6 achieved power levels below the recommended 80% (Cohen, 1988). Thus, one possible explanation for the inconsistency in significant effects in these studies is insufficient statistical power.

To test whether the inconsistency in significant effects in some of the outcome measures is due to insufficient power, a meta-analysis was conducted by combining the data of Studies 4, 5 and 6 for the high and low self-control condition (N = 450). A set of T-tests revealed a statistically significant effect of condition for all outcome measures. Because a Levene Test indicated that the variances were significantly different for environmental donation ($p < .001$), and for pro-environmental intentions ($p = .020$), the T-tests for these dependent variables were based on unequal variances. The T-tests indicated a statistically significant difference between the high and low self-control condition, for environmental donation ($t(429.45) = 3.70$, $p < .001$), recycling choice ($t(448) = 3.80$, $p < .001$), pro-environmental intentions ($t(440.41) = 3.67$, $p < .001$), and for likelihood to engage in pro-environmental behaviour measured using a scale composed of likelihood to recycle, to buy green products, to save water and to reuse items ($t(448) = 4.12$, $p < .001$). The means and standard deviations can be seen in Table 37. Post-hoc power analyses using G*Power 3 (Faul et al., 2007) revealed that, with an alpha level of .05, and effect sizes $d = .349$, $d = .360$, $d = .345$, $d = .390$, power levels of 96%, 97%, 95% and 98% were obtained for the environmental donation, recycling choice, pro-environmental intentions and likelihood to engage in pro-environmental behaviour, respectively. Thus, the meta-analysis for all four outcome measures achieved adequate statistical power, above the recommended 80% (Cohen, 1988), supporting the idea that low statistical power may have led to non-significant results in the individual studies.

Table 37. Means and standard deviations for the dependent variables in the high and low self-control groups

Condition	Environmental donation ($p < .001$)		Recycling decision ($p < .001$)		Environmental intentions ($p < .001$)		Likelihood to engage in pro-environmental behaviour ($p < .001$)	
	M	SD	M	SD	M	SD	M	SD
High self-control (N =226)	22.63	25.03	5.90	3.12	6.61	2.20	5.13	1.19
Low self-control (N = 224)	14.72	20.09	4.76	3.22	5.80	2.49	4.63	1.37

To test the two alternative hypotheses, H2a and H2b, the combined data from Studies 5 and 6 (N = 361) was analysed for each environmental outcome, as only these two studies included a measure of attitudes. Furthermore, an analysis was conducted to understand if there were any significant differences in environmental attitudes across the sample.

Environmental attitudes: A T-test indicated that there was no significant difference in NEP scores across the two groups, $t(359) = 1.44$, $p = .150$. Participants in the low self-control condition ($M = 3.63$, $SD = 0.94$, $N = 176$) did not report significantly lower environmental attitudes than did those in the high self-control condition ($M = 3.76$, $SD = 0.84$, $N = 185$).

Environmental donation: To test H2a, a moderation analysis using the PROCESS macro (Hayes, 2018; Model 1, 5000 bootstrap re-samples, variables were not mean centred) was conducted. The moderation analysis indicated no statistically significant interaction between attitudes and experimental condition, $b = 4.12$, 95% CI [-1.069, 9.316], $p = .119$. The regression coefficients for the moderation analysis can be seen in Table 38. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an effect size $f^2 = .007$, and an alpha level of .05, a power level of 35% was obtained for detecting the contribution of the interaction to the model.

Table 38. Summary of multiple regression for moderation analysis

	b	SE B	t	p
NEP	5.05	1.78	2.83	p = .005
Condition	-10.38	10.05	-1.03	p = .302
Condition x NEP	4.12	2.64	1.56	p = .119

Note. Fit for model $R^2 = .09$, $F(3, 357) = 12.16$, $p = .001$

To test H2b, a two-step hierarchical regression was conducted with donation as the dependent variable. Environmental attitudes (NEP) were entered at Step One of the regression, and self-control was entered at Step Two. The hierarchical regression revealed that at Step One, NEP contributed significantly to the regression model, $F(1, 359) = 29.28$, $p < .001$, and accounted for 7.5% of the variation in environmental donation. In Step Two, the two predictors explained 8.6% of the variance, ($R^2 = 0.081$, $F(2, 358) = 16.95$, $p < .001$). NEP ($\beta = .27$, $p < .001$) was a statistically significant predictor, and condition was also a significant predictor ($\beta = .11$, $p = .038$). Adding condition to the regression model explained an additional 1.1% of the variation in environmental donation, and this change in R^2 was statistically significant ($p = .038$). A summary of the regression analysis can be seen in Table 39. A post-hoc power analysis using G*Power 3 (Faul et al., 2007), showed that, with an alpha level of .05, and an effect size $f^2 = .012$, a power level of 55% was obtained for detecting the increase in variance explained by adding condition to the model.

Table 39. Summary of hierarchical regression analysis for variables predicting environmental donation

	B	SE B	β	R^2	ΔR^2
Step 1				0.075	0.075**
NEP	7.14	1.32	0.28**		
Step 2				0.086	0.011**
NEP	6.94	1.32	0.27**		
Condition	4.88	2.34	0.11**		

$^{\dagger}p < 0.10$, *p < .05, **p < .01

Recycling choice: To test H2a, a moderation analysis using the PROCESS macro (Hayes, 2018) was conducted (Model 1, 5000 bootstrap re-samples, variables were not mean centred). No statistically significant interaction between attitudes and experimental condition was found, b = 0.39, 95% CI [-0.325, 1.095], p = .286. The regression coefficients for the moderation analysis can be seen in Table 40. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an effect size f^2 = .003, and an alpha level of .05, a power level of 18% was obtained for detecting the contribution of the interaction to the model.

Table 40. Summary of multiple regression for moderation analysis

	b	SE B	t	p
NEP	1.02	0.24	4.17	p < .001
Condition	-0.70	1.37	-0.51	p = .613
Condition x NEP	0.39	0.36	1.07	p = .286

Note. Fit for model R^2 = .13, F(3, 357) = 17.67, p < .001

To test H2b, two-step hierarchical regression was conducted with recycling choice as the dependent variable. Environmental attitudes (NEP) were entered at Step One of the regression, and self-control was entered at Step Two. The hierarchical regression revealed that at Step One, NEP contributed significantly to the regression model, F(1, 359) = 46.10, p < .001, and accounted for 11.4% of the variation in recycling choice. In Step Two, the two predictors explained 12.7% of the variance, (R^2 = 0.13, F(2, 358) = 25.93, p < .001). NEP (β = .33, p < .001) was a statistically significant predictor, and condition was a statistically significant predictor (β = .11, p = .023). Adding condition to the regression model explained an additional 1.3% of the variation in recycling choice, and this change in R^2 was statistically significant (p = .023). A summary of the regression analysis can be seen in Table 41. A post-hoc power analysis using G*Power 3 (Faul et al., 2007), showed that, with an alpha level of .05, and an effect size f^2 = .015, a power level of 64% was obtained for detecting the increase in variance explained by adding condition to the model.

Table 41. Summary of hierarchical regression analysis for variables predicting recycling choice

	B	SE B	β	R^2	ΔR^2
Step 1				0.114	0.114**
NEP	1.23	0.18	0.34**		
Step 2				0.127	0.013**
NEP	1.19	0.18	0.33**		
Condition	0.73	0.32	0.11**		

$^{\dagger}p < 0.10$, *p < .05, **p < .01

Pro-environmental intentions: To test H2a, a moderation analysis using the PROCESS macro (Hayes, 2018; Model 1, 5000 bootstrap re-samples, variables were not mean centred) was conducted. No statistically significant interaction between attitudes and experimental condition was found, b = 0.15, 95% CI [-0.324, 0.631], p = .528. The regression coefficients for the moderation analysis can be seen in Table 42. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an effect size $f^2 = .001$, and an alpha level of .05, a power level of 9% was obtained for detecting the contribution of the interaction to the model.

Table 42. Summary of multiple regression for moderation analysis

	b	SE B	t	p
NEP	1.22	0.16	7.41	p < .001
Condition	0.05	0.92	0.06	p = .955
Condition x NEP	0.15	0.24	0.63	p = .528

Note. Fit for model $R^2 = .26$, $F(3, 357) = 42.37$, p < .001

To test H2b, a two-step hierarchical regression was conducted with pro-environmental intentions as the dependent variable. Environmental attitudes (NEP) were entered at Step One of the regression, and self-control was entered at Step Two. The hierarchical regression revealed that at Step One, NEP contributed significantly to the regression model, $F(1, 359) = 116.26$, p < .001, and accounted for 24.5% of the variation in pro-environmental intentions. In Step Two, the two predictors explained 26.2% of the variance, ($R^2 = .262$, $F(2, 358) = 63.47$, p < .001). Both the NEP (β = .49, p < .001) and condition (β = .13, p = .004) were statistically significant predictors. Adding condition to the regression model explained an additional 1.7% of the

variation in pro-environmental intentions, and this change in R^2 was statistically significant ($p = .004$). A summary of the regression analysis can be seen in Table 43. A post-hoc power analysis using G*Power 3 (Faul et al., 2007), showed that, with an alpha level of .05, and an effect size $f^2 = .023$, a power level of 82% was obtained for detecting the increase in variance explained by adding condition to the model.

Table 43. Summary of hierarchical regression analysis for variables predicting pro-environmental intentions

	B	SE B	β	R^2	ΔR^2
Step 1				0.245	0.245**
NEP	1.31	0.12	0.50**		
Step 2				0.262	0.017**
NEP	1.29	0.12	0.49**		
Condition	0.62	0.22	0.13**		

†p < 0.10, *p < .05, **p < .01

Likelihood to engage in pro-environmental behaviour: To test H2a, a moderation analysis using the PROCESS macro (Hayes, 2018) was conducted (Model 1, 5000 bootstrap re-samples, variables were not mean centred). No statistically significant interaction between attitudes and experimental condition was found, b = 0.03, 95% CI [-0.229, 0.297], p = .798. The regression coefficients for the moderation analysis can be seen in Table 44. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an effect size $f^2 = .001$, and an alpha level of .05, a power level of 9% was obtained for detecting the contribution of the interaction to the model.

Table 44. Summary of multiple regression for moderation analysis

	b	SE B	t	p
NEP	0.60	0.09	6.70	p < .001
Condition	0.24	0.51	0.48	p = .630
Condition x NEP	0.03	0.13	0.26	p = .798

Note. Fit for model $R^2 = .22$, $F(3, 357) = 33.90$, $p < .001$

To test H2b, a two-step hierarchical regression was conducted with likelihood to engage in pro-environmental behaviour as the dependent variable. Environmental attitudes (NEP) were entered at Step One of the regression, and self-control was entered at Step Two. The hierarchical regression revealed that at Step One, NEP contributed significantly to the regression model, $F(1, 359) = 89.80$, $p < .001$, and accounted for 20% of the variation in likelihood to engage in pro-environmental behaviour. In Step Two, the two predictors explained 22% of the variance, ($R^2 = 0.22$, $F(2, 358) = 50.96$, $p < .001$). NEP ($\beta = .44$, $p < .001$) was a statistically significant predictor, and condition was a statistically significant predictor ($\beta = .15$, $p = .002$). Adding condition to the regression model explained an additional 2% of the variation in likelihood to engage in pro-environmental behaviour, and this change in R^2 was statistically significant ($p = .002$). A summary of the regression analysis can be seen in Table 45. A post-hoc power analysis using G*Power 3 (Faul et al., 2007), showed that, with an alpha level of .05, and an effect size $f^2 = .026$, a power level of 86% was obtained for detecting the increase in variance explained by adding condition to the model.

Table 45. Summary of hierarchical regression analysis for variables predicting likelihood to engage in pro-environmental behaviour

	B	SE B	β	R^2	ΔR^2
Step 1				0.20	0.20**
NEP	0.64	0.07	0.45**		
Step 2				0.22	0.02**
NEP	0.62	0.07	0.44**		
Condition	0.37	0.12	0.15**		

$^{\dagger}p < 0.10$, *p < .05, **p < .01

3.8.7 Discussion

Study 6 provides additional evidence that self-control has a causal influence on pro-environmental behaviour, supporting H1. The findings were consistent with previous studies, in that self-control appeared to affect pro-environmental behaviour tendencies in the same manner: higher self-control led to increased pro-environmental tendencies, while low self-control led to decreased pro-environmental tendencies, across the various outcome measures used. Participants in the high self-control condition reported higher scores on a composite measure of likelihood to engage in pro-environmental behaviour, higher general pro-environmental

intentions and higher scores in the recycling decision scenario, than did those in the low self-control condition. The effect of self-control on environmental donation, although not significant, was in the same direction as the other outcome measures. This pattern is consistent with the previous studies in this chapter, suggesting that higher levels of self-control are associated with more engagement in pro-environmental behaviour, whereas lower levels of self-control are associated with less pro-environmental behaviour.

One of the aims of the study was to help better understand the effectiveness of the manipulations in influencing behaviour, compared to a neutral control, different from the one in Study 5, where there were no differences between the high self-control condition and the control condition. Two alternative explanations were discussed. Based on the qualitative comments, it was proposed that the task in the control condition (describing a diagram) may have bolstered participants' self-control perceptions. The other possibility was that that low self-control drove the results. Although, in this study, the task in the control condition was selected based on past tasks used to maintain self-control constant, and none of the qualitative comments suggested that participants had encountered difficulties with it, the results were similar to those in Study 5. There were no significant differences between high self-control and the control condition in self-control perceptions, scores on the modified self-control scale, nor in the environmental outcome measures. Although there were significant differences between the low self-control and the control condition in self-control perceptions and in scores on the modified self-control scale, these differences were not present for the environmental outcome measures; there were no statistically significant differences between the low self-control condition and the control condition in any of the environmental outcome measures studied. As there was no evidence to suggest that the task in the control condition bolstered self-control in this study, of the two explanations provided in Study 5, it is more likely that low self-control drove the effects, and that the high self-control condition did not enhance self-control relative to individuals' average self-control levels. However, if the low self-control drove the effects, this should have also been reflected in differences between pro-environmental outcomes in the low self-control and the control condition, which were not significant in this study.

Despite the ambiguity related to the control condition, the main aim of the experiment was to demonstrate the causal role of self-control in pro-environmental behaviour, and the significant differences between the high and low self-control conditions support this. H1 was supported by correlational findings in Studies 1, 2 and 3, and Studies 4, 5 and 6 add further support to the causal nature of the relationship between self-control and pro-environmental behaviour, with self-control positively influencing pro-environmental behaviour. To increase statistical power, a

meta-analysis was conducted combining the results from Studies 4, 5 and 6. The results support H1, yielding consistently statistically significant effects across all the environmental outcomes included. The findings thus suggest that the effect of self-control over environmental outcomes is robust.

Furthermore, one of the participants in the high self-control condition explicitly referred to recycling, when asked to describe situations in which they successfully exercised self-control: *"Another area where I show my self control is with my recycling. It is easier sometimes to just throw things away and forget about it but my self-control allows me to collect everything and take it to the proper bin. Sometimes it is not fun especially in bad weather but I get up and do it anyway"*. This is consistent with the findings of Farrelly and Tucker (2014) and Johnstone and Tan (2015), whose participants used self-control notions when discussing pro-environmental behaviour. This suggests that some individuals may also construe pro-environmental behaviour as an action that requires self-control.

The experiment also addressed hypotheses H2a and H2b, and, consistent with Studies 1, 2, 3 and 5, added further support to H2b, but not to H2a. It was found that self-control and the NEP were independent predictors of general pro-environmental intentions, recycling decision and likelihood to engage in pro-environmental behaviour. The meta-analysis combining data from Studies 5 and 6 confirmed these findings for all four outcomes (general pro-environmental intentions, recycling decision, environmental donation and likelihood to engage in pro-environmental behaviour).

Overall, Study 6 adds further support to the pattern of results found in Studies 1, 2, 3, 5 and 6 provides consistent support for H1, indicating that self-control influences pro-environmental behaviour, and that self-control and motivation independently predict behaviour (H2b).

3.9 General discussion

The set of studies supports the hypothesis that self-control influences pro-environmental behaviour. Studies 1, 2 and 3 provide evidence that individual self-control relates to a range of pro-environmental behaviours, as predicted in the first hypothesis. In Study 1, trait self-control, measured using Tangney et al.'s Brief Self-Control scale (2004) was positively correlated with a general measure of pro-environmental behaviour. In Studies 2 and 3, the same measure of self-control was found to correlate with a measure of a more specific pro-environmental behaviour – recycling. Although the effect sizes of the correlations in this chapter ($r = .14$, Study 1; $r = .18$, Study 2; $r = .15$, Study 3) would be considered small according to Cohen's (1988) guidelines (a correlation coefficient of .10 is considered to be a small effect, a correlation coefficient of .30 is

considered to be a medium effect, and a correlation coefficient of .50 is considered to be a large effect), they are consistent with typical effect sizes of self-control on other beneficial behaviours (de Ridder et al., 2012). Furthermore, the correlations were consistent across the three studies, and a meta-analysis across the three studies confirmed the robustness of the effect (r = .16), across the two behaviour measures in a sample of 1201 individuals.

In relation to the two alternative hypotheses regarding the role of self-control in relation to attitudes, the pattern of results across the three studies indicated that self-control predicted pro-environmental behaviour above and beyond relevant attitudes, but did not moderate the relationship between attitudes and behaviour. In other words, the attitude-behaviour relation was not stronger in participants with high self-control than in those with low self-control. Although the findings in the literature have been mixed, the current findings provide support to the idea that both self-control and motivation contribute to enacting behaviours, but operate as independent predictors (Gerrits et al., 2011; Sproesser et al., 2011; Tomasone et al., 2015). This finding also extends the findings of Gerrits et al. (2010), Sproesser et al. (2011), and Tomasone et al. (2015), who demonstrate that self-control predicts behaviours related to food consumption, such as fruit and vegetable consumption, or dieting, independently of motivation. Although the strength of the relationship between self-control and pro-environmental behaviour was weaker than that found between attitudes and pro-environmental behaviour in this set of studies (e.g., $\beta = .18$ for self-control, and $\beta = .39$ for the NEP in Study 1), and in past literature (e.g., $\beta = .33$ for the NEP, Robinson et al., 2019), the findings in this chapter suggest that, overall, self-control contributes significantly and consistently to explaining pro-environmental behaviour, beyond the contribution of attitudes.

Study 4 showed that self-control plays a causal role in pro-environmental behaviour. Self-control was manipulated experimentally, via a procedure designed to increase the regulatory accessibility of self-control constructs, which would in turn lead to behaviour in line with these constructs (Ein-Gar, 2016). The results indicated that high self-control led to more pro-environmental tendencies, whereas low self-control led to decreased pro-environmental tendencies. Studies 5 and 6 provide further support for these findings, providing a pattern of results consistent with that obtained in Study 4. While Studies 1, 2 and 3 demonstrate the existence of a positive relationship between self-control and pro-environmental behaviour, Studies 4, 5 and 6 highlight the causal role of self-control in this relationship. To further explore this hypothesis, a meta-analysis combining the data from Studies 4, 5 and 6 was conducted to increase statistical power. Its findings indicated a robust influence of self-control on all environmental outcomes explored in these studies. As predicted in H1, higher levels of self-

control led to improved environmental outcomes, whereas lower levels of self-control lead to reduced environmental outcomes.

Studies 5 and 6 also explored the role of environmental attitudes as motivation to engage in pro-environmental behaviour, to address hypotheses H2a and H2b. The same pattern of relationship with environmental attitudes found in Studies 1, 2 and 3, was found in Studies 5 and 6. Self-control affected behaviour together with environmental attitudes, and did not moderate the relationship between self-control and environmental attitudes. This was also replicated in a meta-analysis combining the data from Studies 5 and 6. This adds causal evidence to the correlational evidence in Studies 1, 2 and 3, in support of H2b.

Studies 5 and 6 also intended to establish how the self-control manipulation influenced pro-environmental tendencies, compared to a neutral control. Although there were no significant differences between the high self-control, and the control condition, nor between the low self-control, and the control condition in pro-environmental tendencies, those in the high self-control condition showed significantly higher pro-environmental tendencies compared to those in the low self-control condition. Together with the correlational findings in Studies 1, 2 and 3, this suggests that lower levels of self-control are detrimental to pro-environmental behaviour, whereas higher levels are beneficial.

On the whole, the six studies in this chapter suggest that self-control is consistently linked to pro-environmental behaviour across a range of environmental outcomes. As predicted, higher levels of self-control lead to improved environmental outcomes, whereas lower levels of self-control lead to reduced environmental outcomes. Furthermore, self-control appears to predict behaviour independently from environmental attitudes.

Considering that individual environmental attitudes generally tend to be high (European Commission, 2017) the current research suggests that policy makers and researchers should consider ways in which individual self-control can be improved. In Studies 5 and 6, it was shown that lower self-control is linked to decreased pro-environmental tendencies; although it was not clear whether improving self-control leads to improved environmental outcomes, given the ambiguity regarding the control condition, combined with the findings of Studies 1, 2 and 3, where self-control was correlated to pro-environmental behaviour regardless of attitudes, this suggests that higher self-control is linked to higher pro-environmental behaviour. Although the procedure used in this chapter to manipulate self-control may not have enhanced self-control compared to a neutral control, the psychology literature has addressed a range of other interventions that can be used to improve individual self-control, with practical relevance for policy makers and marketers interested in promoting pro-environmental behaviour (Mann et al.,

2013). Policy-makers and researchers should explore the use of these tools and strategies to support pro-environmental behaviour, by enhancing or supporting individual self-control, given that lower self-control lead to less engagement in pro-environmental behaviour, as shown in this chapter. As suggested in the previous chapter, self-control also has a positive influence on other often challenging behaviours (de Ridder et al., 2012). Therefore, the use of these strategies could have wide-ranging benefits, not limited to pro-environmental behaviour.

In relation to these implications, the next chapter in this thesis will review self-control strategies in more depth and will focus on a particular strategy with potential to influence pro-environmental behaviour. This strategy will then be implemented in a marketing-based intervention aimed at enhancing pro-environmental behaviour.

3.9.1 Contribution

This set of studies has several contributions. First, the studies provide evidence on how self-control influences pro-environmental behaviour, thus helping to better understand factors involved in pro-environmental behaviour. The findings reveal a new, independent predictor of pro-environmental behaviour and highlight the environmental benefits of higher levels of individual self-control.

Empirical evidence on the role of self-control in pro-environmental behaviour is limited, although this issue has been theoretically addressed (Nielsen, 2017). The current findings provide empirical support to previous discussions regarding the role of self-control processes in pro-environmental behaviour (Nielsen, 2017), and provide insights that can be used to develop interventions for enhancing pro-environmental behaviour, by strengthening individual self-control. Furthermore, by highlighting the causal role of self-control in pro-environmental behaviour, the findings suggest that marketers and policy makers may draw on insights from the self-control literature to support individual self-control, and avoid the negative environmental consequences of lower levels of self-control. The psychology literature has addressed varied strategies and interventions to enhance self-control, which marketers and policy makers can apply to enhance pro-environmental behaviour.

The findings also add to the self-control literature. Self-control is already documented to support a series of beneficial behaviours such as healthy eating or academic performance, whereas a lack of self-control is linked to undesirable behaviours such as smoking or alcohol addiction, gambling, overeating and others (de Ridder et al., 2012). This research confirms the positive influence of self-control on another set of behaviours (pro-environmental behaviours), and further strengthens the evidence for its positive effects on a wide range of domains of

human life. Self-control is researched to positively influence pro-social behaviours related to cooperation (Martinsson et al., 2012). This research further adds to this branch of the literature, by providing evidence that self-control positively influences another type of behaviour that is also beneficial to others. The findings contribute to a set of the self-control literature that has suggested that self-control and motivation are both required in enacting a behaviour, bringing further support to the findings of Gerrits et al., (2010), Sproesser et al. (2011) and Tomasone et al. (2015) that self-control and motivation predict behaviour independently.

Finally, the findings in this chapter also provide a contribution to better understanding the gap found between people's motivations and their pro-environmental behaviours (Carrington et al., 2010, 2014). Although the literature has largely focused on motivations for pro-environmental behaviour, others have highlighted that numerous obstacles prevent individuals from engaging in pro-environmental behaviour (Gleim & Lawson, 2014). By approaching this issue from the perspective of self-control, this research addresses one of the processes by which individuals may overcome obstacles that prevent them from engaging in pro-environmental behaviour, and thus helps better understand the motivation-behaviour gap. The findings in the thesis suggest that having pro-environmental motivations, such as attitudes, is not sufficient to engage in pro-environmental behaviour; self-control is also needed for individuals to engage in pro-environmental behaviour.

3.9.2 Limitations and future research

The studies in this chapter also have limitations. First, considering that the Studies 1 and 2 were advertised as studies on "environmental decision-making" and "recycling preferences," respectively, there could be a sample bias in that people who were more interested in environmental issues could have chosen to partake in the studies. This was not considered to be an issue for Study 3, which was advertised as "a study on rationality," nor for Studies 4 and 5 as these were advertised as "a study on writing styles." Although research has shown that participants' motivation to participate in online studies (for example, interest in a specific topic compared to financial compensation), does not bias responses (Abeler & Nosenzo, 2014), it would be insightful to conduct further research on a sample that is less motivated to engage in pro-environmental behaviour. Nonetheless, the findings of Study 3 were consistent with Studies 1 and 2, despite the different motivations that the participants might have had for taking part in the studies. Another limitation of Study 1 and Study 2 is the sample demographic. Although the sample was quite varied in age across both studies, both samples for studies 1 and 2 were mostly female. However, Study 3 replicated the findings in a more gender balanced sample.

Furthermore, Studies 4, 5 and 6 are based on a specific type of self-control manipulation that

relies on priming high or low self-control perceptions. It is possible that participants may have their own lay theories or beliefs that self-control is required for pro-environmental behaviour. In fact, one of the participants in Study 6 wrote about the self-control that they exercise in order to recycle, when asked to write about instances when they exhibited self-control. Therefore, it is possible that, when participants' perceptions about their self-control are reduced, or enhanced, they might act on their lay theories and report reduced, or, respectively, increased pro-environmental behaviour tendencies. Further research with other manipulations of situational self-control should be conducted.

Furthermore, in Studies 5 and 6, there were no significant differences between the high self-control, and the control condition, nor between the low self-control, and the control condition in pro-environmental tendencies. To more clearly establish the role of enhancing self-control in influencing behaviour compared to individuals' average self-control, further studies should address how this manipulation affects behaviour compared to a baseline, in the context of both pro-environmental behaviour, and other behaviours outside the environmental sphere, that have been more commonly researched in the literature. This is important, considering that the majority of research that relies on priming individual self-control via recalling past instances of self-control success or failure only addresses two levels: high and low (Ein-Gar, 2015; Ein-Gar & Steinhart, 2017; Nikolova et al., 2015).

Another limitation of all the studies in this chapter is that due to the online design of the studies it was impossible to measure observable behaviour. As such, the studies rely on self-report measures, which may be subject to social desirability bias (Randall & Fernandes, 1991). Nevertheless, research indicates that social desirability has a very limited impact on self-report measures of pro-environmental behaviour or attitudes (Milfont, 2009). The relationships between self-report measures of self-control and a wide range of behaviours are also shown to be robust when controlling for social desirability bias (Tangney et al., 2004). These findings suggest that social desirability bias may not necessarily be an issue in this study. However, the self-report measures used in this study, along with environmental preferences in hypothetical scenarios, may not be as accurate as objective behaviour measures. Although research tends to indicate a strong association between self-reported and observed pro-environmental behaviour, a substantial amount of variance between these two remains unexplained (Kormos & Gifford, 2014). Therefore, future research should also address objectively measured behaviour.

The online nature of the studies meant an overall lack of control over the participants' environment, and thus concerns about the noise and accuracy of results. However, the studies yielded similar results consistent with past research, as outlined in Tables 46, 47 and 48.

Table 46. Cronbach's α for self-control scale in current studies in comparison with previous studies

	Cronbach's α
Study 1	.87
Study 2	.85
Study 3	.86
Tangney et al. (2004)	.85

Table 47. Cronbach's α for pro-environmental behaviour measure in Study 1 in comparison with previous studies

	Cronbach's α
Study 1	.76
Barbaro and Pickett (2015)	.77

Table 48. Comparison of current and past studies for NEP Cronbach's α and association with pro-environmental behaviour

	Cronbach's α	Association with pro-environmental behaviour
Study 1	.77	$r = .37$, $p < .001$
Clark et al. (2003)	.80	-
Casey and Scott (2006)	.84	$r = .45$, $p < .001$
Gatersleben et al. (2014)	.81	$r = .36$, $p < .001$

Finally, the current research was limited to examining a single type of motivation for pro-environmental behaviour: attitudes. Although attitudes are the most common predictors of pro-environmental behaviour, and considered a key predictor of pro-environmental behaviour, other research raises issues with regards to their ability to predict pro-environmental behaviour (Bamberg & Möser, 2007). Future research should explore the role of self-control in conjunction with other motivators of pro-environmental behaviour.

Chapter 4: Implications of the relationship between self-control and pro-environmental behaviour: using implementations intentions in marketing

4.1 Introduction

The previous chapter explored the empirical links between self-control and pro-environmental behaviour. One implication of these findings is that improvements in one's self-control may lead to improvements in one's pro-environmental behaviour, considering that lower levels of self-control were associated with lower environmental tendencies, whereas higher levels of self-control were associated with higher environmental tendencies.

A broad range of strategies that can help improve individual self-control have been researched in the literature, in relation to other beneficial behaviours and could thus help enhance pro-environmental behaviour. Furthermore, given that social marketing has the potential to reach wider audiences to achieve behaviour change, implementing self-control strategies in social marketing may be an effective way to enhance pro-environmental behaviour.

In particular, implementation intentions is a self-control strategy that has been shown to help support individuals' self-control in numerous social-psychology interventions for behaviours such as healthy eating, dieting, or exercising (Gollwitzer, 1999). The typical implementation intentions manipulation involves a lengthy procedure of instructing people to form their own implementation intentions sentences or to repeat sentences provided by the experimenters. This would not be suitable in a marketing context, in which consumers are reluctant to take instructions (Clee & Wicklund, 1980) and have limited attention for promotional messages (Hoffman & Daugherty, 2013).

However, based on findings reviewed in this chapter, this thesis proposes the use of a new format for implementation intentions, based on a short sentence and relevant visual imagery, to reproduce the effects of conventional implementation intentions interventions.

To this end, this chapter will review strategies that have been shown to enhance individual self-control and will identify implementation intentions as a self-control strategy suitable for use in a marketing intervention. Following this, the chapter will review the relevant literature on implementation intentions, to identify a suitable format for marketing application in order to promote pro-environmental behaviour. Finally, the chapter will delineate the aims of the next set of studies in this thesis.

4.2 Social marketing and self-control strategies

Social marketing provides an opportunity to implement interventions for behaviour change on a wide scale (Corner & Randall, 2011; Haq et al., 2013). The use of self-control strategies as part of social marketing could thus have wide-ranging pro-environmental benefits. Social marketing is defined as the use of marketing tools and techniques to influence the behaviour of a target audience in ways that benefit individuals or society as a whole (Kotler, Roberto, & Lee, 2002). Social marketing has been successfully used in the field of public health, in anti-smoking campaigns, campaigns to reduce alcohol use or drug use or campaign to promote physical activity (Gordon, McDermott, Stead, & Angus, 2006), reducing violence (Potter, Moynihan, & Stapleton, 2011), obesity prevention (Stead, Arnott, & Dempsey, 2012), promoting child vaccination (Nowak, Gellin, MacDonald, & Butler, 2015). A key advantage of social marketing is flexibility, as it can be used to reach different types of stakeholders on a wide scale, including individuals, businesses or governmental stakeholders (Peattie & Peattie, 2009). Furthermore, social marketing typically draws on empirical evidence and insights from the psychology or consumer behaviour literature in designing messages to be disseminated to individuals (Haq et al., 2013).

Social marketing typically employs marketing communication messages in the form of adverts, such as videos, posters, print adverts (Corner & Randall, 2011; Potter et al., 2011), although other formats can also be used to deliver messages: competitions, workshops and information brochures (Stead et al., 2012). In the environmental context, social marketing involves the use of marketing techniques, and in particular, advertising campaigns to enhance pro-environmental behaviour (Kollmuss & Ageyman, 2002). In recent years, social marketing has become an increasingly common approach among governmental and non-governmental organisations for promoting pro-environmental behaviour (Burchell, Rettie, & Patel, 2013; Corner & Randall, 2011). Despite the increasing use of social marketing to encourage pro-environmental behaviour, the academic literature evaluating the effectiveness of environmental social marketing interventions is not extensive (Gregory-Smith et al., 2014). The effectiveness of social marketing interventions has mainly been demonstrated in fields such as public health, while empirical evidence on the effectiveness of social marketing for pro-environmental behaviour is limited (Truong, 2014). This highlights a need for further research on approaches that can effectively be used in environmental social marketing (Truong, 2014).

A prominent approach to behaviour change, based on insights from behavioural economics, that has also been adopted in social marketing is “nudging” (Velema, Vyth, & Steenhuis, 2017). Nudging involves steering individuals towards desirable behavioural options (Thaler &

Sunstein, 2008). Nudging is based on the idea that individuals do not always make choices that are in their best interest, based on weighing costs and benefits of alternatives (Kahneman, 2011). Due to limits to cognitive processes and attention, individuals often rely on mental heuristics in their decisions; while these heuristics facilitate faster decisions, they can also lead to suboptimal decision making with negative long-term consequences (Kahneman, 2011). Nudges can involve the use of these heuristics in the context in which decisions are made, to facilitate positive, desirable behavioural outcomes without limiting individual choices (Thaler & Sunstein, 2008). One such example is the use of defaults, one of the most well-known nudges (Johnson et al., 2012). Defaults are the option that people automatically receive or see if they do not explicitly specify otherwise, and they are typically chosen significantly more often than if another option is designated as the default (Johnson et al., 2012). Green nudges, that aim to promote pro-environmental behaviour, have been proposed as potential tools for behaviour change, with potential to be used in social marketing (Schubert, 2017). However, although nudges have been demonstrated to be effective in a range of health-related behaviour, more research is needed on effective green nudges (Byerly et al., 2018; Lehner et al., 2016).

Self-control strategies could thus be used as nudges, in social marketing, to influence the variables involved in decision-making (e.g., self-control) and thus to facilitate desirable environmental outcomes without restricting individual choice. Therefore, this research will also explore how a particular self-control strategy can be used as a nudge in a social marketing approach.

4.3 How can self-control be enhanced?

Although numerous self-control strategies have been documented, it is not clear to what extent these are suitable to marketing application. The next section reviews some of the main self-control strategies explored in the literature, with a view to understanding which of these might prove suitable for marketing applications.

4.3.1 Enhancing trait self-control

One set of strategies is related to enhancing individuals' trait self-control, which have primarily been developed for use in early childhood and adolescence (Moffitt et al., 2011). Previous research indicates that trait self-control can be improved with self-control programs applied in childhood, such as cognitive coping tasks designed to develop children's self-control knowledge and skills, or role-playing in self-control situations (Piquero, Jennings, & Farrington, 2010). Diamond and Lee (2011) also reviewed interventions for improving children's self-control in classroom and school environments, and they found that curriculum activities focused on

improving self-control have been shown to lead to improvements in individual self-control (Diamond & Lee, 2011). In this type of intervention, teachers can be trained to build children's competencies in self-control, recognizing and managing feelings, and interpersonal problem-solving (e.g., waiting and thinking before acting, or building action plans) (Diamond & Lee, 2011). Extra-curricular activities such as martial arts, yoga, aerobic, or mindfulness activities are also shown to help improve children's chronic self-control traits, with the implication that these should be incorporated in school curricula to lead to improved self-control outcomes in children, particularly as such interventions are shown to benefit those students lowest in these skills the most (Diamond & Lee, 2011).

The use of such programs to enhance self-control could benefit pro-environmental behaviour and other beneficial behaviours long-term. However, given the complex procedures involved in these interventions, their wider scale implementation remains challenging (Moffit et al., 2011).

4.3.2 Enhancing situational self-control

Another category of strategies concerns strategies that help individuals better overcome self-control conflicts in a given situation (Duckworth et al., 2016). The literature has explored several strategies that enhance individual self-control in specific situations, supported by numerous studies (Duckworth et al., 2016).

One such strategy involves remembering past instances of self-control successes, which has been advanced as a strategy with potential to enhance self-control in consumer decision contexts (Haws, 2016). This type of strategy is shown to enhance current self-control by enhancing the mental accessibility of self-control constructs and by enhancing perceptions about one's self-control levels (Ein-Gar & Steinhart, 2017; Nikolova et al., 2015; vanDellen & Hoyle, 2010). Nikolova et al. (2015) show that when one can easily recall self-control successes, this facilitates self-control in subsequent decisions related to consumption choices. Ein-Gar (2015) uses a similar approach to influence commitment to virtuous behaviour, indicating that successfully recalling past self-control successes can positively influence commitment to virtuous behaviours. However, these studies only compared manipulations for high and low self-control. The same approach was also taken in the studies in Chapter 3, which also included a comparison with a neutral control condition. Although the findings were consistent with past findings, in that high self-control led to significantly more of the desired (pro-environmental) behaviour compared to lower self-control, it was not clear whether this manipulation effectively enhanced self-control, and thus pro-environmental behaviour, compared to a neutral control condition. As such, in these studies it was not clear to what extent this manipulation could be used as an intervention to enhance pro-environmental behaviour.

Another category of self-control strategies pertains to planning and prospection, which require individuals to be able to anticipate a self-control conflict (Nielsen, 2017). This set of strategies addresses the physical availability of temptations (Duckworth et al., 2016; Myrseth & Fishbach, 2009). This involves foreseeing the possibility of a self-control conflict and choosing or modifying situations to support goal pursuit and reduce the likelihood of a self-control conflict (Duckworth et al., 2016).

Individuals may thus choose to avoid tempting situations, and thus restrict the future availability of temptations (Nielsen, 2017). For example, one may anticipate the problem of having unhealthy snacks available in the kitchen and may choose to buy fruits instead (Myrseth & Fishbach, 2009). Similarly, one might foresee that at the end of a work day, fatigue might prevent them from going to the gym, and as such might change their situation by working out at the beginning of the day (Mann et al., 2013). Other research has indicated that in the case of food, individuals choose to avoid tempting aisles in the supermarket (Inman, Winer, & Ferraro, 2009). Furthermore, preparing simple plans also support goal-directed behaviour. For instance, preparing a shopping list can help reduce impulse purchases when going to the supermarket (Inman et al., 2009). In fact, research on trait self-control indicates that individuals with higher trait self-control tend to employ avoidance strategies more frequently than those low in self-control, suggesting that temptation avoidance is an important self-control strategy (Hofmann et al., 2012). When situations cannot fully be avoided, individuals can also change their environment to facilitate self-control. For instance, one can place their alarm-clock farther away from the bed, so that one must get out of bed to turn the alarm clock off, and thus ensure they do not oversleep (Duckworth et al., 2016).

However, it is not always possible to change one's environment, or to avoid temptations (Haws, 2016). Another category of strategies thus addresses cognitive changes in the mental representation of choices (Duckworth et al., 2016; Myrseth & Fishbach, 2009; Nielsen, 2017). Certain ways of thinking about a situation have been shown to be more likely to promote self-control than others (Duckworth et al., 2016).

Pre-commitment, or the setting of rewards for achieving goal-directed behaviour, and penalties for failing to engage in these behaviours, has been shown to be an effective self-control strategy (Fishbach & Trope, 2005). Pre-commitment strategies change the choice alternatives, by changing the consequences of behaviour (Mann et al., 2013). By attaching rewards or punishments to behaviours, individuals raise the likelihood that they will engage in goal-directed behaviour, when individuals can foresee future obstacles to behaviour (Trope & Fishbach, 2000). For instance, participants who anticipated that a medical test would be

unpleasant self-imposed higher cancellation fees for not attending the test, and were more willing to make receiving a bonus contingent on attending the test. However, these effects emerged only for those participants who valued health (Trope & Fishbach, 2000). Furthermore, participants were shown to increase their self-control efforts in the presence of self-imposed penalties, and that self-imposed penalties increased participants' intentions to take a test (Fishbach & Trope, 2005). Other research indicates that individuals use self-imposed, costly deadlines, to decrease procrastination (Ariely & Wertenbroch, 2002) and purchase smaller packs to limit consumption of unhealthy items (Wertenbroch, 1998). For instance, individuals may choose to buy single, more expensive packs of cigarettes, as opposed to a carton; this not only limits how much one can smoke, but also makes each cigarette more costly, thereby self-imposing a financial penalty (Wertenbroch, 1998).

Changing one's construal of goal-directed behaviour has also been found to improve individual self-control (Mann et al., 2013). As outlined in Chapter 2, behaviour can be mentally represented at different levels; at high construal levels, individuals focus on the abstract, goal relevant features of the behaviour; at low construal levels, individuals focus on the specific and concrete, but more peripheral features of a behaviour or object (Fujita et al., 2006). Higher level construals, in particular, were shown to enhance individual self-control (Fujita & Han, 2009; Fujita et al., 2006). For instance, at higher levels of mental construal, individuals were shown to prefer delayed, larger rewards over immediate, smaller rewards, and were shown to more negatively evaluate temptations related to the goal of studying (Fujita et al., 2006). In the environmental domain, higher level construals were also found to enhance environmental preferences (O'Connor & Keil, 2017), providing further evidence that manipulating construals may be a useful intervention to enhance individual self-control, and in turn, pro-environmental behaviour. In a similar approach, encouraging individuals to consider the future outcomes of their choices was shown to enhance self-control for individuals initially lower in it (Haws et al., 2012). A related strategy that can enhance individual self-control is self-affirmation, which involves reflecting on positive aspects of oneself, such as one's core values (Schmeichel & Vohs, 2009). Self-affirmation has been shown to enhance self-control by inducing higher level construals, and as such may be an alternative manipulation to induce higher level construals (Schmeichel & Vohs, 2009). In the environmental domain, Sparks, Jessop, Chapman and Holmes (2010) found that a self-affirmation manipulation led to increased intentions to recycle, further supporting its potential to enhance pro-environmental behaviour.

Another category that pertains to changing the cognitive representation of choices is choice bracketing (Myrseth & Fishbach, 2009). Bracketing is the process of grouping individual

choices in sets; bracketing can be narrow (single choices or small choice sets) or broad (larger choice sets) (Read, Loewenstein, & Rabin, 1999). In other words, choice bracketing is the framing of outcome of decisions in isolation from other decisions, or as connected with other decision outcomes (Myrseth & Fishbach, 2009). In narrow bracketing, certain factors are not perceived or are given less weight than they would in wider bracketing (Read et al., 1999). Such factors involve added up effects or costs of a choice that become more significant in wider sets, but would not emerge in narrow choices (Read et al., 1999). This strategy thus is argued to enable individuals to more easily identify a self-control conflict (Myrseth & Fishbach, 2009). For instance, if a chocolate bar is seen as isolated from other decisions, the cost of indulging may be seen as trivial; as such the individuals might not identify a conflict between chocolate and a healthy eating goal; however, if the chocolate is perceived in relation to future chocolate temptations, one might identify a conflict (Myrseth & Fishbach, 2009). In another study, Read et al. (1999) asked individuals to choose between a lottery ticket that offered larger, delayed rewards, and a lottery ticket offering smaller, immediate rewards. A broad frame where individuals chose multiple tickets at once led participants to choose the larger, delayed rewards in a higher proportion than in the narrow frame, where participants chose each ticket individually. These findings suggest that the way information related to behavioural choices is presented can affect individuals' decisions.

Another strategy to promote self-control is practicing self-control in situations that require one to overcome obstacles or temptations (Mann et al., 2013). Practicing self-control in one domain has been shown to improve self-control in other domains (Muraven, 2010). For instance, individuals who were asked to avoiding eating sweets for two weeks, or who were asked to hold a handgrip for as long as possible twice a day for two weeks, showed more self-control in a subsequent self-control task than those who did not practice (Muraven, 2010). Oaten and Cheng (2010) found that participants who took part in a 2-month self-regulation programme involving regular physical exercise, performed better on a self-control task and reported an increase in healthy eating, emotional control, maintenance of household chores, attendance to commitments, monitoring of spending and an improvement in study habits. Another longitudinal study (Job, Friese, & Bernecker, 2015) shows that participants who were asked to squeeze a handgrip twice a day for 2 weeks earned higher GPAs and reported more hours spent on study-related activities 7 months after the intervention. These findings suggest that encouraging individuals to practice self-control can help promote self-control in other domains. However, another study found no effects of practicing self-control based on an intervention requiring participants to use their non-dominant hand for all daily activities (Miles et al., 2016). The intervention showed no effects on everyday life behaviours such as drinking alcohol,

skipping lectures, studying, tidying up, eating fruits and vegetables, and on lab-based tasks (e.g., amount of chocolate eaten) (Miles et al., 2016). Considering these findings, it is not clear yet how exactly practicing self-control influences behaviour, and what tasks should be practiced to induce improvement in other self-control tasks.

The final category of strategies reviewed in this section pertains to automatisation. While self-control processes have traditionally been seen as controlled, reflective and effortful, recent literature has identified the role of automatic processes in self-regulation (de Ridder et al., 2012). Individuals have been shown to develop automatic processes that can help them better resist temptations. Furthermore, temptation cues (e.g., cake) were shown to automatically and unconsciously activate the goals that the temptations interfered with (e.g., healthy eating) to the same extent as goal primes, both of which helped participants resist temptations better compared to control primes (Fishbach et al., 2003). Other studies have found that exposure to food temptations enhanced goal importance, goal intentions and goal-directed behaviour, compared to a control (Kroese, Evers, & De Ridder, 2009). Temptations also promoted stronger resistance to temptation and bolstered the importance of the goal in disagreement to the temptation, when participants perceived a conflict with their goals (Ozaki, Goto, Kobayashi, & Hofmann, 2017). This indicates that people can develop automatic processes to counter temptations, although the effects of these strategies have not been used in interventions so far. Another automatic process that can support goal-directed behaviour is habit formation, where an environmental cue become associated with a frequently performed behaviour, and thus the behaviour becomes automatically activated in the presence of the cue (Nielsen, 2017).

Another strategy that relies on automatisation of behaviour is implementation intentions. Implementation intentions involves the creation of "when-then" plans related to the outcomes one desires to achieve (Gollwitzer, 1999). Implementation intentions specify a behaviour to be performed when a particular cue or situation is encountered, in the form of 'When situation Y arises, then I will initiate behaviour Z!' (Gollwitzer & Sheeran, 2009). By associating the behaviour to a cue, the behaviour becomes automatic, and is thus effortlessly triggered when the cue is encountered (Gollwitzer & Sheeran, 2009). Implementation intentions are supported by extensive research in a wide range of fields and have been shown to improve various outcomes such as exercise, healthy eating, and reduced procrastination (Gollwitzer, 1999; Gollwitzer & Sheeran, 2009). Several studies have also demonstrated the potential of implementation intentions to support pro-environmental behaviour (Bamberg, 2002; Bell, Toth, Little, & Smith, 2016). Therefore, the creation of "when-then" plans related to environmental behaviour may help individuals be more environmentally-friendly and may be useful in enhancing pro-

environmental behaviour.

4.4 Marketing application of self-control strategies

Considering the potential of social marketing to influence behaviour change on a broader scale, one particularly useful application of self-control strategies would be as social marketing messages.

However, not all the strategies reviewed in this chapter are suitable for marketing use in advertising or other communications. Strategies for enhancing trait self-control involve complex activities that have to be repeated over longer periods of time (Piquero et al., 2010). Other strategies, like the avoidance of temptations, modifying situations, or developing automatic processes that facilitate self-control, have only been documented to be strategies that some individuals naturally employ in their self-control decisions or conflicts, but have not been tested in interventions.

Other strategies that have been experimentally employed require extensive time and participant willingness to engage in the strategy, which sometimes also involve complex procedures. For instance, manipulations designed to activate higher level construals require individuals to spend time reflecting on the overarching reasons why want to achieve a goal, whereas lower level construals are activated by asking individuals to think in more concrete terms about the actions they take to achieve a goal (Fujita et al., 2006). Similarly, typical self-affirmation manipulations ask individuals to reflect on different values and select the ones most important to them (Sparks et al., 2010). Manipulations for recalling past acts of self-control require individuals to write about occasions when they have exercised (or failed to exercise) self-control (Ein-Gar, 2015; Nikolova et al., 2015). While these manipulations have been shown to support individual self-control in the literature, they require time for individuals to take a step back from present decisions, and reflect on the future, or on the past, which means such interventions may pose challenges for wider scale application, in a marketing approach. Furthermore, in Chapter 3 it was not clear to what extent a manipulation based on recalling past self-control can enhance one's self-control, and thus pro-environmental behaviour.

Choice bracketing, another of the strategies reviewed, refers to the presentation of choices as a single decision versus a decision connected to future decisions (Myrseth & Fishbach, 2009). As it involves the way in which choices are presented, it could be utilised in marketing. For instance, marketing communications could frame different environmental behaviours in a way that would encourage individuals to exercise self-control. However, the empirical findings so far do not clarify what type of bracket is the most effective at promoting desirable behaviour. Some

findings suggest broad brackets are more suitable to promote desirable behaviours (Read et al., 1999). However, others suggest that narrow brackets may lead to better choices by making goals seem more achievable, whereas broad bracketing can make the task seem overwhelming and undermine motivation (Koch & Nafziger, 2009). Fishbach and Zhang (2008) found that more participants chose carrots over chocolates when these were presented apart (narrow bracket), vs. together (wide bracket). In this case, the wider bracket led participants to offset between the healthy eating and enjoyment goals. As such, it is unclear what type of bracketing supports longer-term goals, and in what context.

Finally, one particular intervention is supported by consistent empirical findings and has strong potential for application in marketing: implementation intentions. The conventional manipulation for implementation intentions is also complex: individuals are required to think about and create their own when-then plans, or they are required to repeat specific when-then sentences (Gollwitzer, 1990). However, recent evidence suggests that implementation intentions alongside with imagery may be applicable in marketing, without requiring individuals to form or repeat when-then plans in advance (Fennis et al., 2011). Fennis et al. (2011) demonstrate that providing individuals with information regarding cues and actions to be taken when encountering those cues mimics the effects of conventional implementation intentions. This suggest that implementation intentions may be applicable in a marketing format, in marketing communications employing the implementation intentions sentence adapted to the behaviour promoted, along with visual images of the behaviour. Therefore, implementation intentions may prove useful for wider scale marketing interventions with the potential to reach high numbers of people.

Furthermore, evidence indicates that the conventional, lengthier format of implementation intentions can influence pro-environmental behaviour (Bamberg, 2002; Bell et al., 2016). As opposed to the manipulation explored in Chapter 3, which intended to enhance an individual's general state self-control, this strategy focuses on enhancing self-control specific to a particular behaviour and situation, focusing and directing one's self-control towards that behaviour.

Given the promising findings related to the marketing use of implementation intentions, and the extensive evidence documenting their success in supporting self-control, the next set of studies in this thesis addresses the use of this self-control strategy in a marketing context, for promoting pro-environmental behaviour.

4.5 Implementation intentions

Substantial evidence suggests implementation intentions are a highly effective self-control strategy, which helps people successfully achieve their goals (Gollwitzer, 1999). Implementation intentions are rooted in action goal theory, which postulates that successfully enacting a behaviour requires not only developing the motivation to enact the behaviour (e.g., attitudes and intentions), but also the ability to overcome obstacles facing the implementation of the behaviour (Achtziger & Gollwitzer, 2010). Although people set goals and intentions to behave in certain ways to achieve the goal, they often do not manage to execute the desired behaviour (Brandstatter, Lengfelder, & Gollwitzer, 2001). Many obstacles can intervene in the implementation of goal-directed actions, starting from the point prior to initiating goal-directed actions up to successfully completing them (Gollwitzer & Brandstatter, 1997). This is why self-control, or the ability to overcome obstacles to goal striving, is also required to successfully achieve one's goals (Gollwitzer & Brandstatter, 1997). However, as documented in previous research, people differ in their self-control ability (Tangney et al., 2004). Despite strong green intentions, poor self-control ability could lead to failure in fulfilling these. One way to enhance individuals' self-control and alleviate these failures is self-control strategies, such as implementation intentions (Brandstatter et al., 2001).

Implementation intentions involve forming 'when-then' plans for achieving a goal, such as 'When I encounter situation X, I intend to do Y' (Gollwitzer & Sheeran, 2009). Whereas intentions only specify a desired end-state, implementation intentions specify a good opportunity to perform a goal-directed behaviour, thereby linking an anticipated future situation to a goal-directed behaviour (Adriaanse, Vinkers, De Ridder, Hox, & De Wit, 2011). This creates a commitment to perform the behaviour when one encounters the specified situation (Gollwitzer & Brandstatter, 1997).

Through the use of a 'when-then' statement, implementation intentions specify the time and the context in which the behaviour is to be performed. For instance, one could say, "When I leave the house, I will remember to take a shopping bag with me." Thus, implementation intentions also convert a desired goal state from a highly abstract level to a concrete form, more closely related to daily life (Gollwitzer & Brandstatter, 1997).

Two processes underlie the effectiveness of implementation intentions in enhancing goal achievement: increased mental activation of critical cues and the creation of a strong cue-response link (Webb & Sheeran, 2007). The first involves increasing a cue's mental accessibility in advance, and raising its likelihood to be recognized as an opportunity to act on the intention (Webb & Sheeran, 2007). Implementation intentions' "when" part entails selecting

a critical future situation, thus activating its mental representation and increasing its mental accessibility (Gollwitzer, 1999), as several studies establish (Parks-Stamm, Gollwitzer, & Oettingen, 2010; Webb & Sheeran, 2007). Aarts, Dijksterhuis and Midden (1999) support this, finding that implementation intentions helped participants recognize words describing the critical situational cues faster, thus more successfully enacting the goal of collecting a free coupon. Increased mental accessibility of cues allows people to more easily detect opportunities and suitable moments to perform goal-oriented behaviours (Knäuper et al., 2011).

The second process refers to the then-part, which creates a strong link between the situation and an appropriate goal-directed response (Gollwitzer, 1999). This cue-response link leads to a behaviour's automatic activation when encountering the specific cue (Aarts et al., 1999; Webb & Sheeran, 2007). The initiation of behaviour is shown to exhibit several features of automaticity: immediacy (Gollwitzer & Brandstatter, 1997), efficiency (Brandstatter et al., 2001), and lack of conscious intent (Bayer, Achtziger, Gollwitzer, & Moskowitz, 2009). Thus, forming implementation intentions strategically automates goal striving, and so, few cognitive resources are required for enacting the desired behaviour (Gollwitzer & Sheeran, 2009). This involves delegating control of goal-directed behaviour to determined situational cues (Gollwitzer & Sheeran, 2009), and thus supplementing one's control of goal-directed behaviours with environmental control related to specific cues (Gollwitzer & Brandstatter, 1997). This should mean that even when people become constrained or busy, using implementation intentions could help automatise and more easily perform a behaviour that requires effort, for example recycling.

4.6 Evidence on Implementation Intentions Effectiveness

Gollwitzer and Sheeran's (2006) meta-analysis of 84 studies shows that implementation intentions prove to be a widely effective strategy for enhancing behaviours.

A large part of the literature explores how implementation intentions influence mental processes related to goal achievement, by researching the effects of implementation intentions in improving performance in cognitive reaction time (RT) tasks. Implementation intentions were shown to increase one's action control and lead to immediate, efficient action initiation even under high cognitive load, by measuring response speed in a go/no-go task or a task-switching procedure (Brandstatter et al., 2001). They were shown to alleviate the effects of ego-depletion (reduction of one's self-control capacity), by measuring the effects of implementation intentions on performance in a Stroop task (Webb & Sheeran, 2003) following ego-depletion. Implementation intentions are effective in improving people's prospective memory

(remembering to perform an intended action at the appropriate moment) in tasks such as answering trivia questions, finding the best synonym, or lexical decision tasks (McCrea, Penningroth, & Radakovich, 2014; Meeks & Marsh, 2009; Rummel, Einstein, & Rampey, 2012). Implementation intentions can help the decision maker suppress and thereby avoid being influenced by unconsciously activated automatic effects, such as stereotype priming (Rees, Rivers, & Sherman, 2018). Implementation intentions can also help overcome difficulties in a key aspect of self-regulation: inhibiting a pre-potent, automatic behavioural response or distractor, illustrated through the use of a stop-signal task (Burkard et al., 2014) or a Simon task (Cohen, Bayer, Jaudas, & Gollwitzer, 2008).

Beyond research on cognitive tasks, a significant proportion of the research addresses problematic behaviour areas. In health-related behaviours, implementation intentions have been found to help increase physical activity (Bélanger-Gravel, Godin, & Amireault, 2011), to enhance fruit and vegetable consumption (Harris et al., 2014), to increase healthy eating behaviours (Adriaanse et al., 2011; de Nooijer, de Vet, Brug, & de Vries, 2006), and to decrease alcohol consumption (Armitage, 2009). They are shown to help overcome goal problems, such as failure to get started: to initiate behaviours at inconvenient times (e.g., writing an essay during holidays; Gollwitzer & Brandstatter, 1997), or to overcome an initial reluctance to get started (e.g., eating a low-fat diet; Armitage, 2004). Studies also show the effectiveness of implementation intentions in improving outcomes in academic or learning-related contexts: improving student attendance to classes (Webb, Christian, & Armitage, 2007), shielding students from test anxiety (Parks-Stamm et al., 2010), increasing attendance to health and safety training (Sheeran & Silverman, 2003), and overriding impulsive emotional behaviour (Eder, 2011).

4.7 Implementation intentions and pro-environmental behaviour

The literature acknowledges that pro-environmental behaviour is inherently difficult (Carrington et al., 2010). Enacting pro-environmental behaviours involves numerous obstacles such as increased inconvenience, time, difficulty, personal risks, costs, and efforts (Budeanu, 2007; Peattie & Crane, 2005; Salonen & Åhlberg, 2013). This means that successfully overcoming obstacles is required to engage in pro-environmental behaviour (Carrington et al., 2010). Implementation intentions should thus hold potential to enhance individuals' green behaviour by helping them overcome these obstacles. A small number of empirical studies supports the role of implementation intentions in engendering pro-environmental behaviour.

Bamberg (2002) explored the effect of a conventional implementation intentions manipulations (asking participants to form a specific plan for when to act), on trying out organically produced

food offered by a local bio-shop. Participants were asked to create their own implementation intention, in the form of plan specifying a critical situational cue for the intention to be enacted. In this study, the effect of implementation intentions was found to be similar to that of a monetary incentive. Holland, Aarts and Langendam (2006) utilised implementation intentions in a field experiment to improve recycling in a tele-company. They showed that implementation intentions led to an increase in observed recycling behaviour, both immediately after and 2 months after the manipulation. Similarly, the manipulation in this study involved asking participants to plan, visualise, and write down implementation intentions for how to recycle paper and plastic cups. Bell et al. (2016) explored the effectiveness of an implementation intention manipulation on teenagers' energy saving behaviour. The experiment employed a traditional implementation intention manipulation: participants were asked to fill in if-then sentences and to provide their own. They found an increase in adolescent's self-reported energy-saving behaviour for those who had received the intervention after the manipulation.

As it can be seen, evidence indicates that implementation intentions can increase self-reported energy saving (Bell et al., 2016), and they improve observed behaviour: recycling and organic food purchasing (Bamberg, 2002; Holland et al., 2006). However, in all these studies, participants were given instructions to deliberate on situational cues and based on them, to create their implementation intentions. This type of manipulation is not applicable in a marketing context due to its length and the significant involvement that is required from the participant.

4.8 Marketing application: methodological issues

Marketing often focuses on convincing consumers to purchase specific products. In the last decades, marketing has become an important tool for helping to address societal issues, such as environmental protection, having become an important tool of policy makers (MacFayden, Stead, & Hastings, 1999). However, research on the effectiveness of marketing messages that can enhance green behaviours is scarce, making it important to understand what the most effective strategies are to engender green behaviours. Based on the impressive evidence for the effectiveness of implementation intentions in other domains, there is a wide scope for implementation intentions to help promote pro-environmental behaviour. Questions remain, however, about how they can be used in marketing.

Implementation intentions research employs a typical procedure relying on instructions and repetition. Numerous studies have been done in both laboratory and field settings, where participants are subjected to one of two alternative manipulations. The first is participant

generated implementation intentions, which involve asking participants to think of and form their own implementation intentions (Bamberg, 2002; Brandstatter et al., 2001; Gollwitzer & Brandstatter, 1997; Webb et al., 2007). For example, Sheeran and Silverman (2003) employed a postal questionnaire that was sent to employees, and they included an implementation intention manipulation to enhance attendance at workplace health and safety training courses. They asked individuals to decide when and where they would attend the training courses, with the outcome measure being course attendance. Similarly, Brandstatter et al. (2001) explored whether implementation intentions increase rates of CV writing. They asked participants to decide and write down where they wanted to compose their CV, when they wanted to get started with it, and how they wanted to start composing their CV. The second typical procedure involves experimenter-provided implementation intentions, where participants receive specific implementation intentions and are asked to repeat them (Adriaanse et al., 2014; McCrea et al., 2014; McFarland & Glisky, 2012; Webb & Sheeran, 2003; Wieber, Gollwitzer, & Sheeran, 2014). For example, Brandstatter et al. (2001), asked participants to tell themselves: "*If number 3 appears, I will respond particularly fast!*" with the outcome measure being the speed of responses to the number 3 in a laboratory experiment. Another example in an applied context involved participants telling themselves "'*The next time that I am tempted to eat chocolate, then I will think of dieting*!' or '*The next time that I am tempted to eat chocolate, then I will not eat it!*', following which a self-report of the behaviour was completed after 15 days (van Koningsbruggen, Stroebe, Papies, & Aarts, 2011).

When comparing the two approaches, experimenter-provided sentences were found to be as effective as participant-generated implementations intentions, in an experiment conducted in a field setting (Armitage, 2009). Armitage (2009) compared the use of experimenter provided implementation intentions such as "If I am offered an alcoholic drink then I will tell myself that if I try hard enough I can keep from drinking," with self-generated implementation intentions where participants were asked to specify the situations in which they would drink within government recommended levels.

Armitage's (2009) finding that experimenter-provided and self-generated implementation intentions are similarly effective suggests that implementation intentions can work under minimal information processing and need not involve significant mental effort. As opposed to self-generated implementation intentions, experimenter-provided implementation intentions require significantly less time and effort from the participant, rendering it more suitable in a marketing context where consumers are only briefly exposed to numerous persuasive messages competing for their attention (Fennis et al., 2011). Previous studies have only addressed the

conventional forms (experimenter provided and self-generated) of implementation intentions, in laboratory or applied contexts, leaving little known about the optimal way to apply them in marketing and the minimal amount of processing required.

Although potentially effective, the persuasive application of the short form presents several challenges. Instructing consumers to form or repeat an implementation intention would not be appropriate in a marketing setting, as highlighted in the literature. Receiving instructions or recommendations from a source with a perceived intent to influence is shown to cause reactance in consumers, and to influence them to move in the direction opposite from the instruction, also causing decreased desire to take part in the behaviour (Clee & Wicklund, 1980). Such instructions to repeat a sentence could threaten one's personal freedom of choice and cause unwillingness to take part in the behaviour (Clee & Wicklund, 1980). Furthermore, instructions or recommendations given by a source with a perceived intent to influence can also decrease an individual's intention to conform to it (Lee & Lee, 2009; Wendlandt & Schrader, 2007). Giving instructions to repeat a phrase is also not socially acceptable in many situations (Baumgartner & Pieters, 2008). Furthermore, this is not a conventional approach in marketing, where persuasive messages typically involve rational or emotional appeals used in informative messages, rather than instructions (Hartmann et al., 2014; Green & Peloza, 2014). Finally, in laboratory experiments on implementation intentions where participants are compensated, they expect to be engaged for a substantial amount of time and to invest effort in the task at hand. In a marketing context, hundreds of messages compete for consumers' attention, so they have much less time to process advertising messages (Hoffman & Daugherty, 2013), and are much less motivated to process lengthy information and instructions (Krugman, 1965). Applying implementation intentions in marketing thus requires careful consideration.

The one study exploring the use of persuasive implementation intentions tackles these challenges by providing an appeal that included, instead of instructions, the critical components resulting in effective implementation intentions (Fennis et al., 2011). Participants were provided with information about critical situations that are good opportunities to act and specific goal-directed responses, which enabled the reproduction of the crucial processes underlying implementation intentions' effectiveness (increased mental accessibility of critical situations and the cue-response link). This was achieved using a website, with a text-based format: participants were asked to read a website encouraging the use of a pocket guide with information about sustainable products, for choosing sustainable products over non-sustainable alternatives. The website described critical situations in which the pocket guide could be used. Participants were, at a later time, asked to report on their sustainable purchase behaviours. Whilst textual, narrative

information is useful in a range of contexts; in a marketing context, consumers have less time and are less motivated to process lengthy information (Hoffman & Daugherty, 2013) than they would in a lab experiment. Furthermore, visual formats are more effective at capturing attention (Hoffman & Daugherty, 2013). Exploring the use of implementation intentions persuasively in visual formats would be highly valuable.

Considering these issues, this set of studies proposes the use of the implementation intentions in a brief, to-the-point form that addresses the intended viewer: *When you encounter situation X, perform behaviour Y.* One of the key questions addressed is whether seeing this statement in a marketing relevant format has similar effects to telling it to oneself.

4.9 Imagery

One way to support the processes underlying the effectiveness of implementation intentions, in a manner relevant to marketing, is application of mental imagery. Mental imagery is a cognitive process through which individuals mentally mimic perceptual, motor, or emotional experiences, leading to a representation of sensory information in working memory (MacInnis & Price, 1987; Knäuper et al., 2011). Knäuper, Roseman, Johnson and Krantz (2009) classify two goal-related imagery types: outcome (of achieving the goal) or process (of the behaviours leading to goal achievement). Outcome imagery emphasizes the experience (positive feelings, benefits) of goal achievement and is a motivational strategy for increasing goal achievement. Process imagery emphasises the steps required in goal achievement (i.e., running in order to lose weight) and is a planning, volitional strategy (Escalas & Luce, 2004) shown to be more effective than outcome imagery in increasing goal achievement (Pham & Taylor, 1999).

Implementation intentions and process mental imagery are based on similar processes. In forming implementation intentions, one predetermines when and where to perform goal-directed actions, strengthening the cue-response link. Similarly, process imagery involves planning, rehearsing, and priming a plan and steps required for goal achievement, strengthening cognitive links between actions and outcome (Escalas & Luce, 2004), leading to vivid, cognitively accessible mental representations of relevant situational cues and goal-directed behaviours (Murphy, Nordin, & Cumming, 2008).

Process imagery is empirically shown to increase the mental accessibility of situational cues and appropriate goal-directed responses, and thus to increase implementation intentions' effectiveness regarding collecting a reward or increasing fruit and vegetable consumption; in this study, respondents were asked to imagine enacting the implementation intention (Knäuper et al., 2009). However, directly instructing participants to imagine enacting implementation

intentions is not practical in brief persuasive messages. A more suitable strategy to promote mental imagery is vivid marketing imagery (Fennis et al., 2011). Marketing imagery can refer to a persuasive message in the form of pictures, video, sounds, as well as narratives.

Vividness refers to imagery quality: clarity, intensity, and distinctiveness (MacInnis & Price, 1987). Nisbett and Ross (1980, p. 45) see vividness as involving elements that are "*emotionally interesting, concrete, image provoking and proximate in a sensory, temporal or spatial way*." Vivid appeals have been demonstrated to increase mental imagery processing (Petrova & Cialdini, 2005). Vividness in marketing appeals can be manipulated using the presence or absence of pictures (Kisilius & Sternthal, 1984), narrative vs. pallid information (Keller & Block, 1997), concrete, user-focused rather than abstract text, illustrations or videos (Fennis, Das, & Fransen, 2012; Rossiter & Percy, 1980).

Fennis et al.'s (2011) study successfully uses vivid appeals to create mental imagery and supplement implementation intentions, providing promising results for the use of mental imagery in marketing. Their approach uses vivid and rich narrative information to generate imagery. Fennis et al. (2011) find that persuasive implementation intentions only affected behaviour when accompanied by vivid appeals; when they were not accompanied by vivid appeals, the implementation intentions failed to affect behaviour.

Although narrative is useful in persuasive communication, the use of pictorial imagery can also prove very valuable. Visual imagery such as video or pictures have important advantages over text in persuasive messages. Previous research suggests that pictures rich in cues can increase cognitive elaboration of information and, subsequently, increase mental accessibility (Kisilius & Sternthal, 1984). Visual representations are processed differently than are verbal messages and are not subject to the same logical scrutiny and counter-argumentation. They are also more likely to be internalized than verbal messages, thus more likely to affect behaviour (Coulter & Zaltman, 1994). Research also documents the importance of visual images in marketing communications (Coulter & Zaltman, 1994), showing better recall than verbal stimuli (Lutz & Lutz, 1977; Mitchell & Olson, 1981). Miniard, Bhatla, Lord, Dickson and Unnava (1991) also emphasize the imagery-evoking ability of pictures in ads. Previous literature indicates that vivid images lead to elaborate visual imagery processing (Babin & Burns, 1997) and therefore, to higher recall rates (Burns, Biswas, & Babin, 1993; Miller, Hadjimarcou, & Miciak, 2000).

Capturing the attention of consumers is a critical aspect in contemporary marketing, characterised by substantial amounts of both image and text-based messages competing for consumers' attention (Hoffman & Daugherty, 2013). This is particularly prominent online, which has become a major marketing medium (Spilker-Attig & Brettel, 2010). To have the

chance to be effective, messages need to first be noticed; substantive evidence shows that images are more effective than text in capturing attention and getting noticed than text (Pieters & Wedel, 2004), a finding which was also recently replicated in an online, social media context (Hoffman & Daugherty, 2013). Based on this evidence, and combined with the findings of Fennis et al. (2011), it is expected that implementation intentions augmented with vivid visual imagery prove more effective than do implementation intentions lacking visual augmentation.

4.10 The current research

A limited number of studies address the role of implementation intentions in pro-environmental behaviour. These rely on conventional implementation intentions, which are not suitable for a wider-scale application in marketing. Despite proposals about their marketing usefulness (Gollwitzer & Sheeran, 2009), only one study explores implementation intentions in a persuasive context (Fennis et al., 2011), leaving significant opportunities for further exploration. Fennis et al. (2011) use a textual format that requires ample time for participants to read the message. Given the limited time of individuals to process information in day-to-day life, research should explore other marketing formats where individuals have less time to engage with the message. Since visual imagery (pictures/videos) are a prevalent element in marketing, testing whether imagery generated through vivid visual imagery can also enhance implementation intentions' effectiveness would be insightful for marketers. Fennis et al. (2011) also rely on self-reported data, which may be subject to social desirability bias and are typically considered less accurate than are direct behavioural measures. This suggests that there is a need to examine the effects of brief implementation intentions on direct behavioural measures.

The second part of this thesis thus sets out to understand whether implementation intentions can be used to promote green behaviour in a brief, visual format adapted to marketing use. Two main questions will be addressed to better understand the use of implementation intentions in marketing. First, considering the lack of empirical evidence on a brief, visual formats for implementation intentions, this research will first attempt to investigate whether the effects of implementation intentions can be replicated in a brief format, and whether this format produces mental processes similar to the conventional format. Secondly, the research will attempt to understand whether implementation intentions can be applied, in this brief format, to enhance pro-environmental behaviour. The expectation is that implementation intentions should be successfully induced in a brief format, alongside imagery, and that implementation intentions should significantly improve pro-environmental behaviour. The next chapter will test these assumptions empirically.

Chapter 5: Promoting pro-environmental behaviour through the marketing use of implementation intentions

5.1 Introduction

As argued in Chapters 2 and 3, enhancing individual pro-environmental behaviours is key in achieving a more sustainable society (Steg & Vlek, 2009). Much of the existing research focuses on inner determinants of pro-environmental behaviour, such as attitudes and intentions (Steg & Vlek, 2009). However, while people increasingly report positive pro-environmental attitudes and intentions, there is a wide gap between people's environmental intentions and their behaviours (Carrington et al., 2010). In Chapter 3, self-control was examined as a potential facilitator of enacting pro-environmental behaviour, yielding promising results. This chapter explores the usefulness of implementation intentions, as a self-control strategy designed to help individuals overcome obstacles to enacting desired behaviours (Gollwitzer, 1999), in promoting pro-environmental behaviour in a format suitable for marketing. Although implementation intentions have successfully been used in numerous social-psychology interventions for behaviours that require self-control, such as healthy eating, dieting or exercising (Gollwitzer, 1999), their use usually involves a lengthy procedure of instructing people to form sentences or to repeat sentences provided by the experimenters. This would not be suitable in a marketing context in which consumers are reluctant to take instructions (Clee & Wicklund, 1980) and have limited attention for promotional messages (Hoffman & Daugherty, 2013).

In particular, this research explores a novel format for implementation intentions, based on a short sentence and relevant visual imagery to support the mental processes that enable implementation intentions to be effective. The current research aims to understand whether implementation intentions used in this format are as effective as conventional implementation intentions, and whether they can enhance pro-environmental behaviour.

Two hypotheses were developed, based on the literature reviewed in Chapter 4. Although Fennis et al. (2011) found promising results regarding the persuasive use of implementation intentions supported by narrative, textual imagery, evidence indicates that images are more effective than text in capturing individuals' attention (Pieters & Wedel, 2004), which is a critical aspect of contemporary marketing, where substantial amounts of both image and text-based messages competing for consumers' attention (Hoffman & Daugherty, 2013). Furthermore, research has highlighted that pictures in marketing can evoke imagery and can lead to elaborate visual imagery processing (Babin & Burns, 1997; Miniard et al., 1999), with the potential to support implementation intentions in a brief format based on the implementation intentions

sentence, along with relevant visual imagery via the use of pictures. Therefore, the first hypothesis explored in this chapter is:

> H3: *Implementation intentions can be induced successfully through brief image-based messages, usable in a marketing setting.*

Chapter 3 indicated that self-control plays a role in pro-environmental behaviour, with higher levels of self-control being linked to higher levels of pro-environmental behaviour. As implementation intentions are designed to enhance individuals' self-control, and have been shown to effectively enhance other behaviours which involve difficulties and obstacles (Gollwitzer & Sheeran, 2009; Haws, 2016), the second hypothesis explored in this chapter is:

> H4: *Implementation intentions supported by imagery are effective in promoting pro-environmental behaviour as used in marketing.*

The chapter provides evidence in a set of experiments that address the two hypotheses separately. The first two experiments explore H3, related to the induction of implementation intentions without asking participants to repeat or form a sentence, by simply showing the implementation intentions alongside relevant visual imagery. Experiments 1 and 2 test the effects of this brief form of implementation intentions in cognitive tasks characteristic to the implementation intentions literature, rather than directly the context of pro-environmental behaviour. The use of these tasks should help clearly assess whether implementation intentions in this form influence behaviour, considering that pro-environmental behaviour outcomes are significantly more complex and difficult to objectively measure than individual performance in a computer-based task. Furthermore, by focusing on environmental outcomes, less detail would be given to the mental process underlying implementation intentions. By focusing on cognitive tasks, evidence can be collected regarding the mental processes of brief implementation intentions, to determine if this form produces effects similar to the conventional method.

Following this, experiments 3 and 4A and 4B explore H4, and focus on effectiveness of implementation intentions in this brief format, for pro-environmental behaviour outcomes. The expectation is that alongside imagery, implementation intentions should significantly improve pro-environmental behaviour. In this set of studies, the selected area of pro-environmental behaviour studied was recycling. Plastic cup and plastic bottle recycling were studied in separate field experiments.

5.2 Experiments 1 and 2

To address H3, the first two studies employ cognitive tasks characteristic to the implementation intentions literature. An advantage of this approach is that it provides clear behavioural outcomes, and thus should clearly and quickly indicate whether implementation intentions can enhance behaviour. Improved performance in these tasks would support the effectiveness of implementation intentions. This approach eliminates reliance on self-reported behavioural information, often used in implementation intentions studies (Adriaanse et al., 2011; Fennis et al., 2011; Knäuper et al., 2011), and would also help indicate whether the automaticity element of implementation intentions is replicated in the brief, visual-imagery based version of implementation intentions. This brief form of implementation intentions and imagery should be suitable for use in a marketing context, and particularly in advertising, where images are a key persuasive tool. Experiments 1 and 2 will enable the understanding of whether implementation intentions in a brief, marketing format are effective at enhancing behaviour in a controlled setting, as opposed to studies 3, 4A and 4B, which involve a field experiment approach, and thus less control over the experimental setting. Exploring the use of implementation intentions in cognitive tasks will also help understand whether the mental processes of implementation intentions occur in this format.

5.3 Experiment 1

This study employs a cognitive reaction time task to explore the effectiveness of implementation intentions and imagery, similar to previous implementation intentions research (Brandstatter et al., 2001; Burkard et al., 2014; Cohen et al., 2008).The reaction time (RT) approach also enables the testing of implementation intentions' automaticity element in a marketing setting, by analysing whether people who are shown implementation intentions messages initiate goal-directed behaviours faster and more efficiently in the required situation than people who are not (Brandstatter et al., 2001). This is more difficult to determine for a more complex behavioural outcome, like pro-environmental behaviour, where the exact moment when participants encounter the situation cannot be controlled or recorded. In RT tasks however, the moment when participants encounter the situation can be controlled, with faster response latencies indicating more efficient and immediate behaviour initiation (Brandstatter et al., 2001). By using a RT task, this study should help assess if implementation intentions in a persuasive form, alongside imagery, lead to similar effects to conventional implementation intentions, on the initiation of the behaviour upon encountering the situation.

The cognitive RT task employed in this study is a Stroop task (Stroop, 1935), which involves showing participants colour words displayed in colours congruous or incongruous with their

meaning (i.e., the word "red" displayed in blue). Participants have to identify the display colour of each word as quickly and as accurately as possible. Because the association between the word and what it names is automatic, voluntary effort is required to choose the right word for the colour (Webb & Sheeran, 2003). The task thus requires the behavioural inhibition of an automatic response – reading the word (Logan, 1980) – and evidence has shown implementation intentions can be effective in inhibiting unwanted behavioural tendencies (Gollwitzer, 1999). Implementation intentions should also help to automatize responses to the correct stimuli (Webb & Sheeran, 2003), in this case to increase the automaticity of the required response (colour naming), as opposed to reading the word, which would result in faster overall response times.

Secondly, in the task, attention is divided between relevant and irrelevant stimulus features (Logan, 1980; Logan & Zbrodoff, 1998). When these conflict, the word's meaning interferes with colour naming, and grabs the attention, causing what the literature coins "the Stroop effect" (Larsen, Mercer, & Balota, 2006): participants take longer to determine the colour of the word for incongruous than for congruous trials. One must maintain the attention on the relevant dimension to perform well - an aspect in which previous evidence suggests implementation intentions can prove effective. An implementation intention linking a word to naming its display colour should also increase the mental accessibility of the display colour and thus should attract and focus attention on the display colour, thus reducing the size of the Stroop effect (Gollwitzer & Schaal, 1998). For instance, Cohen et al. (2008) demonstrated the benefits of implementation intentions in reducing the Simon effect (a discrepancy between congruent and incongruent reaction times) in a Simon task similar to the Stroop task.

Webb and Sheeran (2003) explored the effectiveness of implementation intentions in improving performance in a Stroop task for ego-depleted and non-depleted participants. Although implementation intentions helped ego-depleted participants to complete the Stroop task faster and more accurately, they had no effects on non-depleted participants. Webb and Sheeran (2003) propose that an explanation for this could be that non-ego depleted participants had sufficient motivation to perform the task with or without implementation intentions, which would have the most significant benefits when one's self-control resources are exhausted. Yet, most of the implementation intentions RT research is conducted without ego-depletion manipulations, and implementation intentions are still found effective for a range of RT tasks requiring similar behavioural inhibition (Burkard, Rochat, & Van der Linden, 2013; McCrea et al., 2014). This suggests that regardless of ego-depletion, implementation intentions could have an effect on the Stroop task, warranting additional exploration of this task. Importantly, Webb

and Sheeran's (2003) Stroop task only measured total completion time and error rates. In a traditional RT Stroop task, more information can be collected: average reaction time, reaction times for incongruent and congruent trials and the size of the Stroop effect. It could be that a more substantial improvement occurs in the reduction of the Stroop effect, rather than overall completion time. Furthermore, using a RT Stroop task allows for an analysis of reaction times for correct answers only (Davidson, Zacks, & Williams, 2003), where participants successfully inhibited an automatic response, whereas in Webb and Sheeran's (2003) study, the completion time included all the answers, including incorrect ones.

The marketing relevant format in which the Stroop task is presented alongside visual imagery is video. Marketing uses this medium both online and on traditional media such as TV, and research indicates that TV advertising proves highly effective (Danaher & Dagger, 2013). Importantly, this format also has a good fit with the implementation intentions and imagery needed to represent a Stroop task. Conveying the exact form of the implementation intentions for the Stroop task would be limited in a picture, whereas video could convey the behaviour in its entirety, rather than a single moment of it.

The current study thus tests H3 in the context of a Stroop task, with the aim to understand whether implementation intentions plus imagery, along with Stroop task instructions, in a video format, affect average reaction times, accuracy, reaction times for incongruent and congruent trials, and the size of the Stroop effect relative to a control. The study also aims to understand whether implementation intentions alone, utilised together with Stroop task instructions, have any detectable effects on average reaction times, accuracy, reaction times for incongruent and congruent trials, and the size of the Stroop effect relative to a control. The findings reviewed in this chapter suggest that mental imagery supports implementation intentions by increasing the mental accessibility of situational cues and appropriate responses (Knäuper et al., 2009), and that it can be promoted using marketing imagery (Fennis et al., 2011). Fennis et al. (2011) explored a form of persuasive implementation intentions based on providing narrative information about a cue and a situation and found that persuasive implementation intentions only affected behaviour when accompanied by vivid imagery; when they were not accompanied by vivid imagery, the implementation intentions did not affect behaviour. Based on these findings, the prediction is that only Implementation Intentions + Imagery will affect these outcome measures, and lead to improvements over the control condition in average reaction times, accuracy, reaction times for incongruent and congruent trials and the size of the Stroop effect. Implementation Intentions only are not expected to lead to significant changes in the behavioural outcomes measured.

5.3.1 Participants

Participants (N = 257) were recruited online, via the same online recruitment platforms used in Studies 1 and 2 from Chapter 3: Psychological Research on the Net, Online Social Psychology Studies, social networks (Facebook, Reddit), and a university newsletter. Following filtering based on responses to attention and understanding checks, and comments from the participants, 248 viable answers remained.[8] Ages ranged between 18-69 (M = 27.64, SD = 10.95); 162 were female and 86 male. Informed consent was given prior to the experiment, which was approved by the University of St Andrews Ethics Committee. Participants took part in the experiment via the Qualtrics platform using QRTEngine, a JavaScript engine demonstrated to be reliable for conducting RT research on Qualtrics (Barnhoorn, Haasnoot, Bocanegra, & van Steenbergen, 2014). The JavaScript programming language is accurate in recording millisecond timings (Crump et al., 2013) and was successfully used by both Crump et al. (2013) and Barnhoorn et al. (2014) to replicate previous lab results on the Stroop task and other RT tasks. The experiment lasted approximately 10 minutes.

5.3.2 Procedure

Participants were randomly allocated to one of three conditions. In the control condition, participants were shown a video that included basic instructions for the Stroop task that emphasized both speed and accuracy. The video showed the instructions in a sequence of sentences that appeared on the screen, as black text on a plain white background. The instructions can be seen in the sequence in which they appeared in the video (Figure 3). The full text of the instructions was:

> *A series of words will appear on the screen, displayed in different colours. You need to indicate what colour each word is displayed in, by typing the first letter of that colour. There are 4 possible colours and letters to type: r if the word is displayed in red, b for blue, g for green and y for yellow. You need to be as fast and as accurate as possible and to ignore the meaning of the words.*

[8] Seven participants failed the attention check and were removed. One participant did not understand the instructions and was removed. One participant was deleted for leaving a comment that indicated failure to understand the instructions.

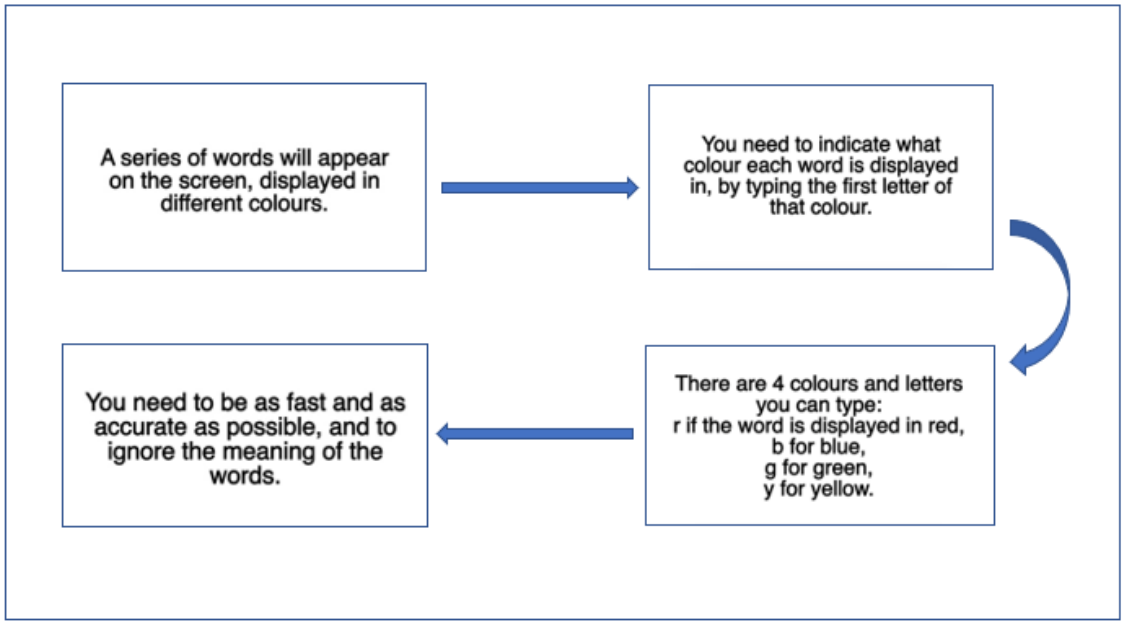


Figure 3. Stroop task instructions in the control condition

Participants in the Implementation Intentions condition were shown the same video, with an added implementation intention after the instructions ("*When the word appears, ignore its meaning and quickly type the first letter of its display colour*!"). This was displayed as an additional sentence at the end of the video, similar to the instructions, using black text on a white background (Figure 4).

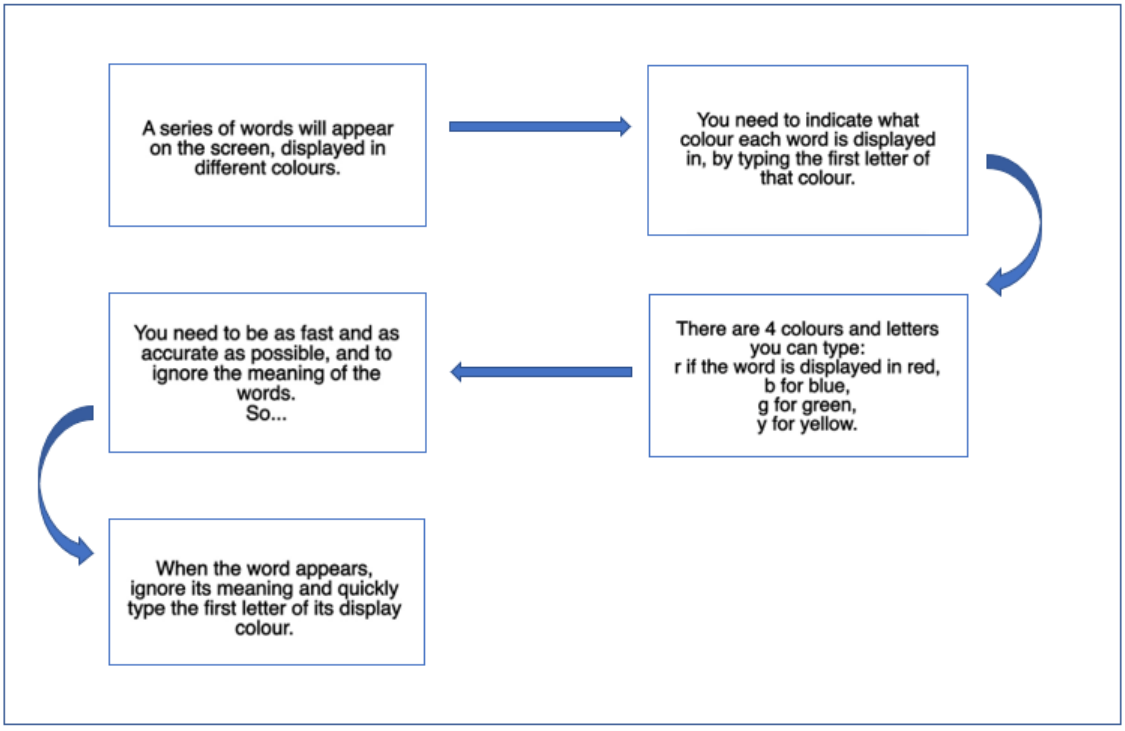


Figure 4. Stroop task instructions in the Implementation Intentions condition

In the Implementation Intentions + Imagery condition (Figure 5), the same instructions as in the control condition video were shown. However, at the end of the video an implementation intentions sentence was shown, accompanied by a video outlining the action of pressing the key corresponding to the colour of the word. In the first example, the word content was blurred to depict the act of ignoring the meaning of the word (blue), while the finger pressed the 'y' key, corresponding to yellow. The video showcased several other trials with correct key presses, but without blurring the content of the word.

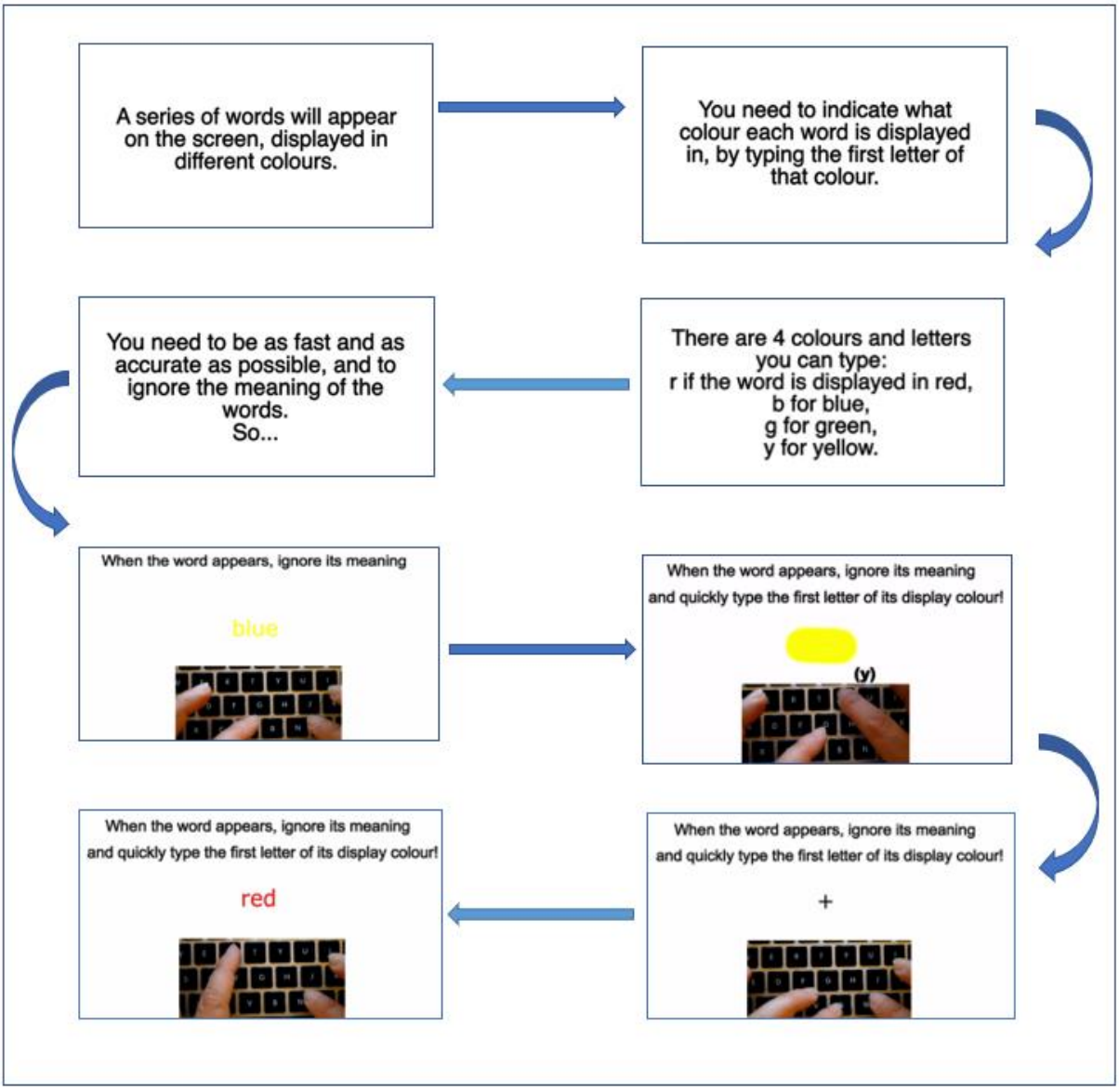


Figure 5. Stroop task instructions in the Implementation Intentions + Imagery condition

The videos were qualitatively pre-tested with 10 participants to ensure clarity and adequate timing of each video, as well as the clarity and vividness of the imagery component of the implementation intentions. To ensure the participants understood the task, two questions tested their understanding. Emphasis was placed on the need to pay full attention whilst completing the task.

The Stroop task included 96 trials (48 congruent, 48 incongruent). Although typical RT tasks require sustained attention over several blocks of trials (Crump et al., 2013), here one 96-trial block was used, similar to Crump et al. (2013) and Barnhoorn et al. (2014) to facilitate higher completion rates and to minimise distraction risks (Brown et al., 2014). Another important consideration for the shorter length was that in the 'real world' marketing environment consumers' time for a choice is limited. All trials started with a fixation cross (500 ms) (Crump et al., 2013; Egloff & Hock, 2003; Heathcote, Popiel, & Mewhort, 1991; Hester, Dixon, & Garavan, 2006; Simon & Berbaum, 1990), after which the word was displayed until the participant pressed one of the 4 possible keys (r for red, b for blue, y for yellow and g for green), followed by a blank interval (500 ms) (Crump et al., 2013; Roelofs, 2003; Simon & Berbaum, 1990). The stimuli appeared in lowercase in 48pt Verdana font, on a white background.

The participants also completed demographical information and data regarding the level of distraction in their environment, on a 9-point scale from 1 ("Quiet and no distractions") to 9 ("A lot of noise and many distractions"). An attention check, to ensure data quality and filter poor quality answers (Mason & Suri, 2012), and a comments and feedback section, to enable the researcher to identify potential problems, were included.

5.3.3 Results

Consistent with previous Stroop reaction time research (Logan & Zbrodoff, 1998; Mutter, Naylor, & Patterson, 2005), all incorrect responses were removed from RT analyses. Next, given the uncontrollable nature of the online environment, it was assumed all answers over 10s were caused by the temporary disengagement of the participant with the experiment (i.e., computer errors or pausing the experiment due to lengthy distractions) and were eliminated, similar to the procedure employed by Savani and Job (2017). Finally, any latencies above 2 standard deviations of the mean RT or faster than 200 ms, which is the minimum amount of time required to perceive and respond to a word (Cooper, Bandelow, & Nevill, 2011), were deleted, also consistent with previous research (Beute & de Kort, 2014; van Steenbergen, Band, & Hommel, 2015). All these steps resulted in a total of 7.2% of the Stroop trial data being excluded from the RT analysis. Overall mean RT times, RT for incongruent and congruent

trials, size of Stroop effect and accuracy rates were computed for each participant. RTs were measured as the time between the Stroop stimulus onset and the keystroke indicating its colour (Crump et al., 2013).

5.3.3.1 Overall reaction times

A mean RT of 911.46 ms, SD = 161.85 ms was obtained across the sample.

Analysis of variance revealed no statistically significant differences between the three conditions in mean RT, $F(2, 245) = 1.80$, $p = .167$. The means and standard deviations for each condition can be seen in Table 49. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) showed that, with an alpha level of .05, and an effect size f = .119, a power level of 37% was obtained.

Due to the large age range and well-known differences in Stroop RT caused by age (Mutter et al., 2005), the effects of age on RT were analysed, yielding a statistically significant correlation between age and RT, $r = .29$, $p < .001$. An ANCOVA controlling for age was thus conducted. A test of the assumption of homogeneity of slopes revealed no significant interaction between age and condition, $F(2, 241) = 0.57$, $p = .569$, partial $\eta^2 = .002$. The ANCOVA revealed no statistically significant effect of condition on Stroop RT, $F(2, 243) = 1.62$, $p = .201$, partial $\eta^2 = .01$, with age as covariate. An analysis on distraction levels (M = 2.41, SD = 1.77), revealed no effect of distraction level on RT, $r = .06$, $p = .342$. As such, no further analysis controlling for the effect of distraction on RT was conducted.

5.3.3.2 Accuracy

A mean accuracy rate of 0.96 (SD = 0.09) was found. As accuracy rates did not have a normal distribution, an arcsine transformation was used (Mutter et al., 2005). ANOVA revealed no statistically significant differences in accuracy between the three conditions, $F(2, 245) = 0.24$, $p = .790$. The descriptives for each condition can be seen in Table 49. A post-hoc power analysis using G*Power 3 (Faul et al., 2007), showed that, with an alpha level of .05, and an effect size f = .054, a power level of 11% was obtained.

No statistically significant correlation between age and accuracy ($r = .10$, $p = .106$) was found. There was no effect of distraction on accuracy, $r = -.03$, $p = .630$. As such, no further analyses controlling for these measures were conducted.

5.3.3.3 Stroop effect, incongruent vs congruent trials

Mean RT times were 834.30 ms, SD = 157.67 ms for congruent trials and 994.39 ms, SD = 186.24 ms for incongruent trials. Due to 4 participants obtaining no correct responses on

incongruent trials, 4 participants were excluded from the analyses on the Stroop effect and incongruent RT. A paired samples t-test indicated a statistically significant difference between congruent and incongruent trials, $t(243) = 26.02$, $p < .001$, indicating the presence of a Stroop effect ($M = 160.40$ ms, $SD = 96.31$). The Stroop effect was statistically significant within each condition (Implementation Intentions + Imagery: $t(90) = 14.42$, $p < .001$; Implementation Intentions: $t(74) = 14.40$, $p < .001$; control: $t(77) = 17.03$, $p < .001$). An ANOVA was conducted to determine how each condition affected congruent reaction times, incongruent reaction times and the size of the Stroop effect. No statistically significant effects of condition on the size of the Stroop effect ($F(2, 241) = 0.33$, $p = .719$), congruent reaction times ($F(2, 245) = 1.94$, $p = .146$), or incongruent reaction times ($F(2, 241) = 1.01$, $p = .368$) were found. The descriptives for each condition can be seen in Table 49. A post-hoc power analysis using G*Power 3 (Faul et al., 2007), showed that, with an alpha level of .05, and effect sizes $f = .054$, $f = .127$ and $f = .089$, power levels of 11%, 41% and 22% were obtained for the Stroop effect, congruent reaction times and incongruent reaction times, respectively.

Considering the correlations of age with congruent RT ($r = .28$, $p < .001$), incongruent RT ($r = .29$, $p < .001$) and the size of the Stroop effect ($r = .11$, $p = .090$) further ANCOVAs were conducted controlling for the effects of age. A test of the assumption of homogeneity of slopes revealed no significant interaction between age and condition for congruent RT ($F(2, 241) = 0.63$, $p = .535$, partial $\eta^2 = .01$), incongruent RT ($F(2, 237) = 1.03$, $p = .358$, partial $\eta^2 = .01$) and the size of the Stroop effect ($F(2, 237) = 0.77$, $p = .457$, partial $\eta^2 = .01$). The ANCOVAs revealed no statistically significant difference between the three conditions in congruent RT ($F(2, 243) = 1.64$, $p = .196$, partial $\eta^2 = .01$), incongruent RT ($F(2, 239) = 0.98$, $p = .378$, partial $\eta^2 = .01$) or the size of the Stroop effect ($F(2, 239) = 0.41$, $p = .663$, partial $\eta^2 = .003$) when controlling for the effects of age.

An analysis on distraction levels revealed no effect of distraction level on Stroop effect ($r = .06$, $p = .336$), congruent RT ($r = .05$, $p = .473$) and incongruent RT ($r = .07$, $p = .291$). As such, no further analysis controlling for the effect of distraction on these measures was conducted.

Table 49. Reaction times and accuracy values for each condition

Condition	Overall RT M (SD)	Congruent RT M (SD)	Incongruent RT M (SD)	Stroop effect size M (SD)	Overall accuracy M (SD)	Accuracy congruent trials M (SD)	Accuracy incongruent trials M (SD)
Control (N = 81)	902.53 ms (163.01)	829.95 ms (164.04)	985.44 ms (178.08)[a]	154.82 ms (80.29)[a]	0.953 (0.107)	0.996 (0.010)	0.910 (0.212)
Implementation Intentions (N = 75)	890.92 ms (158.05)	810.18 ms (147.88)	977.57 ms (190.74)	167.38 ms (100.67)	0.956 (0.097)	0.989 (0.062)	0.923 (0.156)
Implementation Intentions + Imagery (N = 92)	936.06 ms (162.48)	857.78 ms (158.96)	1015.94 ms (189.29)[b]	159.44 ms (105.48)[b]	0.964 (0.078)	0.993 (0.022)	0.936 (0.148)

Note: [a]n = 78, [b]n = 91. The number of participants in these analyses was lower due to 4 participants obtaining no correct responses on incongruent trials, for whom analyses on the Stroop effect and incongruent RT could not be computed.

5.3.4 Discussion

The study found no improvement due to imagery and implementation intentions over simple task presentation in average RT or accuracy, contrary to the initial predictions. The findings in this study thus do not support H3. Although research to date suggests implementation intentions enhance performance in a range of cognitive RT tasks, in this format they did not enhance performance in the task. Neither the Implementation Intentions + Imagery condition, nor the Implementation Intentions condition showed significant improvements over the control condition. The lack of improvements in both accuracy and RT also indicates that implementation intentions did not enhance goal achievement (the goal of responding fast and accurately to the Stroop cognitive task) or the inhibition of undesirable behavioural tendencies (the tendency to respond to the meaning rather than to the colour of the word). Previous research has demonstrated implementation intentions support both goal achievement, and the inhibition of undesirable behavioural tendencies (Gollwitzer, 1999).

Exploring RT provides the possibility to determine whether the desired behaviour was initiated quickly and efficiently, leading to its automatisation, which a reduction in reaction time would suggest (Brandstatter et al., 2001). In the current experiment, neither briefly shown implementation intentions nor implementation intentions alongside imagery increased the response speed to the words' display colour, compared to a plain task presentation, thereby not indicating an increase in the automaticity of the desired response.

Another aspect in which the efficiency of implementation intentions could be reflected is focusing attention on the correct features of the stimuli (Gollwitzer & Schaal, 1998), thus reducing the Stroop effect size. The findings suggest that this was not the case either, and the lack of any additional benefits of implementation intentions or imagery suggests that the manipulation did not prevent attention from being diverted to the irrelevant aspects of the stimulus.

Although purported to support the key processes of implementation intentions (Fennis et al., 2011) and shown to have numerous benefits in marketing (Pieters & Wedel, 2004), visual imagery did not improve behavioural outcomes in this study, with the imagery condition not differing significantly from the implementation intentions condition, nor from the control condition.

It had been expected that no effects be obtained for implementation intentions only, in a brief format, based on past findings. Armitage (2009) demonstrates that minimal information processing is required for implementation intentions to prove effective, where simply providing people with a statement to repeat is shown to be effective in enhancing behaviour. Armitage (2009) further argues that for implementation intentions to be effective, it is not the form or context of implementation intentions that matters, but rather the creation of a link between the situation and behaviour. However, simply reading a statement may not provide enough opportunity for information processing of implementation intentions that would lead to the creation of a link between the cue and the behaviour, as opposed to asking participants to repeat them. The other process by which implementation intentions is argued to influence behaviour is enhancing the mental accessibility of situational cues and appropriate behavioural responses (Gollwitzer, 1999). Fennis et al. (2011) suggests that, in a persuasive format, the mental accessibility of cues and behaviours would not be enhanced without the use of vivid imagery. Fennis et al.'s (2011) findings support this and show that for implementation intentions induced via narrative information, vivid narrative imagery appears to be critical in order influence behaviour. The finding on the lack of effects of the implementation intentions only condition in the current study supports this argument.

However, the addition of imagery to brief implementation intentions did not lead to any improvements in behaviour, contrary to the expectations. There are several possible explanations for why the expected effects did not occur. One would be that the format researched in this study, is not as effective as the conventional form of implementation intentions. It may be that brief implementation intentions shown to participants, even when augmented with imagery, still do not provide enough opportunity for information processing of implementation intentions as opposed to asking participants to repeat them. Thus, this format of implementation intentions may also not have led to the creation of a link between the cue and the behaviour, critical for implementation intentions to influence behaviour (Armitage, 2009). Furthermore, it may be that an implementation intentions manipulation, augmented with visual imagery, as opposed to narrative imagery, which was shown to support persuasive implementation intentions in Fennis et al.'s (2011) study, does not enhance the cognitive accessibility of cues and situations. Visual imagery based on pictures may not be as effective as narrative imagery in supporting the processes behind implementation intentions.

A second explanation is the existence of a ceiling effect, as performance in all three conditions was considerably high, with accuracy levels of approximately 96% across all three conditions. Therefore, another possibility would be that the task was not sufficiently difficult for implementation intentions to have detectable benefits, as performance was already close to the maximum. Given these alternative possibilities, the use of visual imagery alongside implementation intentions in a format suitable for marketing needs more exploration.

5.4 Experiment 2

Based on the findings from Experiment 1, this experiment sets out to further explore H3, and to understand whether a brief implementation intention formulation, alongside visual imagery, can influence behaviour in a different task. Although the findings from the previous experiment did not support the hypothesis, no clear conclusions could be drawn as to why this occurred. Two alternative explanations emerged: either implementation intentions are ineffective in the format proposed in this research, or a ceiling effect led to the null results. Notably, in Experiment 1, the scores were very high across all conditions, indicating there may have been no room for implementation intentions to make a significant improvement. To this end, this study explores the effect of implementation intentions, alongside imagery used in a brief form for a prospective memory task, and it will compare an easy version with a version involving an added element of cognitive difficulty. This approach is based on the design of several other implementation intentions studies (McFarland & Glisky, 2012; Rummel et al., 2012). These studies include additional cognitive tasks to ensure that the task is demanding enough to avoid ceiling effects,

and to prevent performance in the control condition from being so high that there would be no benefit from implementation intentions. This added difficulty also characterises real-life situations, where people are often required to perform several actions at the same time, in order to juggle the various demands of day-to-day life. This comparison should thus help understand whether the previous experiment was affected by a ceiling effect, or whether implementation intentions in this brief form are simply ineffective.

5.4.1 Prospective memory

Prospective memory (PM) is defined as remembering to perform an action at an appropriate time in the future (McFarland & Glisky, 2012). Prospective memory is frequently used in daily life: remembering to collect a prescription from the pharmacy when in town, remembering to phone a relative on their birthday etc. Prospective memory is also relevant for pro-environmental behaviour as many pro-environmental behaviours involve an element of prospective remembering: remembering to take the recycling out on the collection day, remembering to bring a re-usable shopping bag on a shopping trip, remembering to book a car share, and others.

The literature has explored a range of prospective memory tasks. Event-based prospective memory, a commonly used task, involves the participants having to remember to respond to a particular cue. Participants are typically busily engaged in an ongoing task, for instance, making word or picture ratings, reading, answering questions, making lexical decisions. When an intention-related cue appears (e.g., word, concept, or category of items), participants must make a different response than that required for the ongoing task, indicating they have remembered the intention (Hicks, Marsh, & Cook, 2005).

Prospective memory tasks can be further classified into focal tasks and non-focal tasks. The former involves an ongoing task that requires processing of the relevant characteristics of the PM targets (McDaniel & Scullin, 2010; McFarland & Glisky, 2012). For example, participants may be asked to press a specific key when encountering a word in ‘a find the best synonym’ task; in this case, both the ongoing and the PM task require participants to process words (Breneiser, 2009). Non-focal PM tasks involve PM targets that the cognitive processing of the ongoing task does not help detect (Meeks & Marsh, 2009). In other words, the ongoing task does not involve processing characteristics of the PM target (Scullin, McDaniel, Shelton, & Lee, 2010). For example, a PM task requiring participants to press a specific key when encountering a ‘syllable’ (rather than a complete word), during a lexical decision task would be classified as non-focal (Scullin et al., 2010). In this case, the ongoing task requires participants to process words, rather than syllables (Scullin et al., 2010).

5.4.2 Implementation Intentions and Prospective Memory

Prospective memory performance depends on the strength of the association between a target and an intended action, based on the idea that a strong association between cue and intention results in automatic retrieval of the associated intention, reflexively and using few cognitive resources (McDaniel, Guynn, Einstein, & Breneiser, 2004). To support this, McDaniel et al. (2004) report improved prospective memory performance in conditions where the cue and intention were strongly associated.

Similarly, implementation intentions' effectiveness relies on creating a strong association between a cue and an action (Gollwitzer, 1999), which automatises the retrieval of the intention. Because this is a mechanism that improves prospective memory performance, this means that implementation intentions could be a suitable intervention for improving prospective memory, by strengthening the link between the PM target and the desired action. Several studies have demonstrated that implementation intentions can influence performance in various focal prospective memory tasks combined with answering trivia questions, finding synonyms and lexical decision tasks (Breneiser, 2009; McDaniel et al., 2004; McDaniel & Scullin, 2010; McFarland & Glisky, 2012; Meeks & Marsh, 2009).

This renders prospective memory a suitable task for testing the effectiveness of implementation intentions in a brief form. It provides an established task paradigm that would enable a meaningful comparison with the current study. Should a brief, image-based implementation intentions have the same effect of creating a strong association between the cue and intention, the results should indicate a clear improvement in prospective memory performance.

Furthermore, should the triggering of the intended action happen automatically, this should cause no costs to the ongoing task (Breneiser, 2009). If under an implementation intention condition performance is unaffected in the ongoing task, while improving the PM performance, this would provide evidence that implementation intentions can automatise the intended action. Performance in the ongoing task should not be lowered if the intention is triggered automatically and without requiring much cognitive effort. This is supported by several studies on focal, event based prospective memory and the conventional form of implementation intentions (Breneiser, 2009; McFarland & Glisky, 2012). The current study will enable evaluating whether a brief implementation intention has the same effects with regards to automaticity. Conversely, if the ongoing task performance is lowered it would suggest that implementation intentions in this case have not worked automatically.

Much of the research on implementation intentions and prospective memory also incorporates imagery in its classical form (McDaniel & Scullin, 2010; Meeks & Marsh, 2009), which involves asking participants to imagine themselves in the situation. Akin to most of the implementation intentions literature, implementation intentions combined with imagery are found to have significant effects on prospective memory. Most studies have explored the combined effect of implementation intentions with imagery (McDaniel & Scullin, 2010; Rummel et al., 2012) compared to controls. Two, however, demonstrate that imagery combined with implementation intentions is equally effective to implementation intentions only (Breneiser, 2009; McFarland & Glisky, 2012). For marketing applications, however, implementation intentions combined with imagery could have stronger effects than implementation intentions alone. In a brief form, participants are not expected to repeat the implementation intention; this is a case in which imagery should improve the effect of a brief exposure to implementation intentions, where participants do not engage deeply with the implementation intentions. Furthermore, Fennis et al.'s (2011) found that implementation intentions used in a persuasive format based on narrative information were only effective when accompanied by vivid narrative imagery, suggesting that persuasive implementation intentions need to be combined with imagery in order to be effective in influencing behaviour.

5.4.3 Current study

This study explores an event-based focal PM task, which has been the focus of several studies exploring the role of implementation intentions in prospective performance. As in the review above, implementation intentions have been shown to improve focal event-based prospective memory performance. In this case participants are asked to answer trivia questions, and when encountering the word 'ocean', to press a different key than those required to answer the questions.

An element of difficulty, or cognitive busyness (the extent to which one's cognitive resource are engaged by performing several tasks at once; Gilbert & Osborne, 1989) will be added to this task. This approach is based on the design of several PM studies. McFarland and Glisky (2012) include in their trivia task an auditory digit detection task, in an attempt to make the overall task requirements more demanding. Similarly, (Rummel et al., 2012) ask participants to remember a 6-digit number and enter it on the screen after 9-14 trials during the PM task in order to make the task more demanding. This added element will help understand whether Experiment 1 was affected by a ceiling effect, or whether implementation intentions in a brief form are ineffective. The task, under the cognitively busy condition, should be significantly more demanding and

thus reduce the likelihood of a ceiling effect. If performance in the control condition is too high, it may be difficult to recognise any benefits of implementation intentions.

The study will test the use of an implementation intentions and imagery in a brief, marketing form. The marketing relevant format in which the implementation intention is presented is a picture. Marketing uses this medium both online, on posters, billboards and print media, with pictures and posters being commonly used media for marketing messages, and particularly social marketing (Lefebvre, 2011; Potter, Moynihan, Stapleton, & Banyard, 2009). Importantly, this format also has a good fit with the implementation intentions and imagery needed to represent the prospective memory task, as the moment when the word appears on the screen is easy to convey visually. Experiment 2 will thus explore whether showing a written implementation intention along with relevant imagery, can have similar effects to the traditional version, which has not, to date, been studied.

The prospective memory task fulfils several purposes. It will help determine whether implementation intentions in the brief form improve goal attainment, for the goal to perform as well as possible. This task also enables the testing of whether implementation intentions in this format help create a strong association between a cue and an intention, and whether implementation intentions automatically trigger the behaviour. This can be tested by analysing whether people in the Implementation Intentions + Imagery condition initiate goal-directed behaviours more efficiently (that is, without affecting the ongoing task) in the required situation than people in the control condition (Brandstatter et al., 2001). The added dimension of cognitive business should also expand on the automaticity issue. Gilbert and Osborne (1989) argue that attempting to perform multiple operations at once often results in the failure of the least automatic (most effortful) operation – if prospective memory is automatized compared to the control, then performance should be significantly higher, with no costs to the ongoing task. No significant differences in performance in the easier version of the task are expected. The added cognitive business should also help establish whether the results of Experiment 1 were due to a ceiling effect or due to the ineffectiveness of implementation intentions when presented in the current format.

As such, several predictions were made. First, it was predicted that cognitive busyness will affect performance on the task (P1). It was also predicted that Implementation Intentions + Imagery will significantly improve performance in the task relative to standard instruction, in the difficult version of the task (P2), but not in the standard version of the task (P3). Finally, it was predicted that the implementation intentions only condition will not significantly affect performance relative to the control condition, in the difficult version of the task (P4), or in the

standard version of the task (P5). Based on the existing literature on a different form of persuasive implementation intentions (Fennis et al., 2011), the expectation is that implementation intentions in a brief format need to be accompanied by imagery in order to be effective. As such, the implementation intentions sentence alone is not expected to lead to any discernible behavioural changes.

5.4.4 Participants

Participants (N = 448) were recruited online, via the same platforms for conducting psychology research and social media used in Experiment 1. Data were filtered based on responses to the attention check and the task understanding checks. For Reddit participants, there was an additional check whether they had recently completed a similar study on Reddit. No keyboard data were recorded from several participants, who were also removed from the analysis. Following this filtering, 371 viable answers remained.[9]

Ages ranged between 18 and 69 (M = 24.13, SD = 8.59), 228 were female, 140 male, and 3 other. Informed consent was given prior to the experiment, which was approved by the University of St Andrews Ethics Committee.

Participants took part in the experiment via the Qualtrics platform. JavaScript embedded in the survey questions was used to record the keyboard presses required to answer the questions. The experiment lasted between 10 and 15 minutes.

5.4.5 Procedure

The experiment employed a 3 x 2 factorial design. The first factor was instruction type: control condition, implementation intentions, and implementation intentions with vivid imagery. The second factor was task difficulty: standard and difficult. Participants were randomly allocated to one of the three instructional conditions and assigned to the standard or difficult task versions.

[9] Nine participants answered that they did not understand the instructions and were removed. Seventeen participants failed the attention check. Fifteen participants were deleted due to failing the final check whether they were aware that they had to press the space bar when seeing the word ‘ocean’. Eight participants were deleted due to having previously completed a similar study on Reddit. One participant was deleted due to leaving a comment that indicated they had not understood the instructions. No keyboard data were collected from twenty-seven participants, who were not included in the analysis. Comments from these participants indicated that they had pressed the required keys, suggesting that data was not recorded due to technical errors. The breakdown of these participants per instruction condition (control: 9, implementation intentions: 10, implementation intentions + imagery: 8) also suggests that it was not related to the instructional condition.

All participants were provided with the instructions for the task:

> *"You have to complete a multiple choice trivia task. You will be shown trivia questions and a choice of 4 answers. To answer, you have to select one of the 4 answers, by pressing the*
>
> ***1, 2, 3, 4 keys on your keyboard.***
>
> *You only have 12 seconds for each question, so please try to be as fast and as accurate as possible."*

The difficult task included an additional instruction:

> *"You will also be shown an **8-digit number** for a duration of 5 seconds. You need to memorize that number. After 4 trivia questions you will be shown another number and asked to confirm if it is the same, or different than the one you previously saw. You only have 5 seconds to confirm Yes or No, by pressing the **1 or 2 keys**. Then you will be shown a new number to memorize and so on."*

Participants in the control condition were shown the following PM instruction:

> "*There is another part in the trivia task.*
>
> *You should press **the space bar** on your keyboard if you see questions including the word **"ocean"**. You should do this regardless of what the correct answer is."*

Participants in the implementation intentions condition were shown the same PM instruction, followed by an image containing the implementation intention: "When you see the word 'ocean', press the space bar!" (Figure 6).

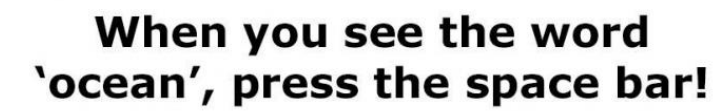


Figure 6. Implementation Intentions only condition

In the Implementation Intentions + Imagery condition, participants were shown the PM instruction followed by an image containing the implementation intention: "When you see the word 'ocean', press the space bar!" alongside an image depicting a finger pressing the space bar (Figure 7).

Figure 7. Implementation Intentions + Imagery condition

The implementation intention image was qualitatively pre-tested with 8 subjects to assess the clarity and vividness of the implementation intentions' imagery component.

Following the instruction manipulations, participants had a trial run of the task to ensure that all participants were familiar with it prior to the measured responses. Following the trial run, a question tested whether participants understood the task and an attention check was implemented. Emphasis was placed on the need to pay full attention whilst completing the task.

The prospective memory task involved 44 general knowledge questions selected from a set of 299 questions from various areas and different degrees of complexity, which have been extensively used in cognitive research (Tauber, Dunlosky, Rawson, Rhodes, & Sitzman, 2013). Out of these, 5 were PM targets and included the word 'ocean.' Participants were allowed a maximum of 12 seconds to respond to each question. Once a question was answered, the next one appeared. The questions asked in the trivia task can be found in Appendix B.

For the difficult task, participants were shown an 8-digit number after every 4 questions. This follows the procedure used in a classic study on cognitive busyness (Gilbert & Osborne, 1989). Participants were asked to memorise this number, and after 4 trivia questions they were shown another number and asked whether it was the same or a different number.

At the end of the experiment, demographic information was collected along with a check whether the implementation intention and imagery manipulation was perceived as vivid. Participants were asked to rate on a Likert type scale whether they though the image was clear, vivid, and whether it accurately depicted the task, with answers ranging from 1 ("Strongly Disagree) to 5 ("Strongly Agree").

A final check was included, which asked participants whether they were aware that they had to press the space bar when they saw the word 'ocean'. For those participants recruited from Reddit, an additional check was included to ascertain whether they had completed a similar trivia task on Reddit. The trivia and PM task were pretested on Reddit, so this step was taken to avoid familiarity with the task and with the questions. A final question was included to assess the level of distraction in the environment of the participants, measured on a 9-point scale from 1 ("Quiet and no distractions") to 9 ("A lot of noise and many distractions").

5.4.6 Results

5.4.6.1 PM performance

A 3 x 2 factorial ANOVA was conducted, revealing a statistically significant main effect of task difficulty, $F(1, 365) = 34.05$, $p < .001$ and instruction condition $F(2, 365) = 7.07$, $p = .001$, on prospective memory performance. The descriptive statistics for each of the factors be seen in Tables 50 and 51. Bonferroni corrected post-hoc analyses revealed a statistically significant difference between Implementation Intentions + Imagery and Control ($p = .006$) and between Implementation Intentions + Imagery and Implementation Intentions ($p = .006$), but not between Implementation Intentions and Control ($p = 1.000$). The interaction was not statistically significant, $F(2, 365) = 1.33$, $p = .265$.

Table 50. Mean Proportions of correct Prospective Memory responses per task difficulty

	Proportion of Correct PM responses	
	M	SD
Standard task (N = 215)	0.65	0.28
Difficult task (N = 156)	0.48	0.31

Table 51. Mean Proportions of correct Prospective Memory responses per instruction condition

	Proportion of Correct PM responses	
	M	SD
Control (N = 117)	0.54	0.32
Implementation Intentions (N = 116)	0.54	0.29
Implementation Intentions + Imagery (N = 138)	0.65	0.28

However, considering that the main predictions of the study related to specific effects of implementation intentions in different versions of the task, rather than to the omnibus ANOVA conducted, a set of planned comparisons related to the hypotheses were conducted. This follows

McDaniel and Scullin's (2010) approach where the omnibus ANOVA was considered less insightful for testing the main hypothesis that implementation intentions would improve PM performance in a difficult version of a lexical decision task. Rather, McDaniel and Scullin (2010) employed a set of planned comparisons directly addressing each hypothesis of their study.

This study employs a similar approach, considering that planned contrasts are adequate when a set of pre-defined predictions are tested (Field, 2018).

To examine P1, that cognitive busyness will affect performance in the task, a contrast between PM performance in the standard and difficult version of the task, under standard task instructions, was conducted. To examine P2, that Implementation Intentions + Imagery will significantly improve performance in the task relative to standard instruction, in the difficult version of the task, a contrast between PM performance in the control and Implementation Intentions + Imagery condition, in the difficult version of the task was conducted. To examine P3, that Implementation Intentions + Imagery will not significantly improve performance in the task relative to standard instruction, in the standard version of the task, a contrast between PM performance in the control and Implementation Intentions + Imagery condition, in the standard version of the task was conducted. To examine P4, that the Implementation Intentions only condition will not significantly affect performance relative to the control condition, in the difficult version of the task, a contrast between PM performance in the control and Implementation Intentions condition in the difficult version of the task was conducted. To examine P5, that the Implementation Intentions only condition will not significantly affect performance relative to the control condition, in the standard version of the task, a contrast between PM performance in the control and Implementation Intentions only condition in the standard version of the task was conducted.

Planned contrasts revealed a statistically significant difference in performance in the prospective memory task in the control group between the easy and the difficult conditions, $F(1, 365) = 18.65$, $p < .001$. This indicates that the added element of difficulty significantly lowered performance, confirming P1. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an alpha level of .05, and an effect size $f = .227$, a power level of 99% was obtained. The means and standard deviations for PM performance in these groups can be seen in Table 52.

Planned contrasts revealed a statistically significant difference between Implementation Intentions + Imagery and control ($F(1, 365) = 10.60$, $p = .001$) in the difficult condition, confirming P2. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that,

with an alpha level of .05, and an effect size f = .173, a power level of 91% was obtained for this contrast. There was no statistically significant difference between Implementation Intentions and control ($F(1, 365) = 0.61$, $p = .436$), confirming P4 and indicating that imagery is required for the implementation intentions in this brief form to be effective. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an alpha level of .05, and an effect size f = .044, a power level of 14% was obtained.

An additional planned contrast was conducted to understand the effect of Implementation Intentions alone, compared to Implementation Intentions + Imagery. A statistically significant difference was found between Implementation Intentions only and Implementation Intentions + Imagery, $F(1, 365) = 6.63$, $p = .010$. This suggests that when the implementation intention sentence is accompanied by visual imagery, it has positive effects on behaviour, compared to the implementation intentions sentence alone. The means and standard deviations for PM performance in these groups can be seen in Table 52.

No significant difference was found between Implementation Intentions + Imagery and control in the standard condition ($F(1, 365) = 2.04$, $p = .155$), confirming P3, nor between Implementation Intentions and Control in the standard condition ($F(1, 365) = 0.03$, $p = .867$), confirming P5. Post-hoc power analyses using G*Power 3 (Faul et al., 2007) revealed that, with an alpha level of .05, and effect sizes f = .077 and f = .008, power levels of 32% and 5% were obtained for testing P3 and P5, respectively.

An additional contrast was conducted to explore the difference between Implementation Intentions only and Implementation Intentions + Imagery in the standard condition. No significant difference was found, $F(1, 365) = 2.30$, $p = .123$. The means and standard deviations for PM performance in these groups can be seen in Table 52.

Notably, although performance in the Implementation Intentions + Imagery condition was significantly higher than in the Control condition in the difficult version of the task, it still remained significantly lower than performance in the easy task in the Implementation Intentions + Imagery ($F(1, 365) = 5.35$, $p = .021$), indicating that cognitive business drove performance levels away from a potential ceiling effect. The means and standard deviations for PM performance in these groups can be seen in Table 52.

Table 52. Mean proportions of correct Prospective Memory responses per task difficulty and instruction condition

Condition	Standard task			Difficult task		
	N	M	SD	N	M	SD
Control	71	.63	.28	46	.40	.34
Implementation Intentions	62	.62	.28	54	.44	.28
Implementation Intentions + Imagery	82	.70	.27	56	.58	.30

5.4.6.2 Ongoing task performance

Due to a programming error, no data was recorded for one of the 39 trivia questions, and this question was not included in the analysis. A 2 x 3 ANOVA was conducted, revealing no statistically significant differences between the task difficulty ($F(1, 365) = 0.56$, $p = .456$) or instructional condition ($F(2, 365) = 0.18$, $p = .837$), nor for their interaction $F(2, 365) = 0.704$, $p = .495$). The means and standard deviations for each condition can be seen in Table 53.

Table 53. Mean Proportions of Correct Trivia Answers per task difficulty and instruction condition

Condition	Standard task			Difficult task		
	N	M	SD	N	M	SD
Control	71	.61	.15	46	.64	.16
Implementation Intentions	62	.64	.13	54	.62	.14
Implementation Intentions + Imagery	82	.62	.15	56	.64	.12

5.4.6.3 Additional checks

The study also included a check to determine whether participants thought the image used for implementation intentions was vivid, clear, and whether it accurately depicted the task on a 5-point scale, from 1 (“Strongly Disagree”) to 5 (“Strongly Agree”). The scores received were

very close to 5, indicating that the image used was appropriate for the manipulation, and can be seen in Table 54.

Table 54. Vividness check for the Implementation Intentions + Imagery condition

	Mean	SD
Did the task accurately describe the task?	4.50	1.20
Was the image vivid?	4.28	1.24
Was the image clear?	4.43	1.20

Additional analyses controlled for the effects of age, which is known to affect event-based PM performance (Schnitzspahn & Kliegel, 2009). A statistically significant correlation was found between age and PM performance, r = -.11, p = .034. An ANCOVA controlling for the effects of age on prospective memory performance was conducted. A test of the assumption of homogeneity of slopes revealed no significant interaction between age and condition, F(2, 359) = 0.15, p = .862, partial η^2 = .001, between age and task difficulty, F(1, 359) = 1.07, p = .302, partial η^2 = .003, nor a three-way interaction between age, task difficulty and condition, F(2, 259) = `.08, p = .340, partial η^2 = .01. The ANCOVA yielded patterns similar to those obtained in the ANOVA, both the main effects of task difficulty (F(1, 364) = 35.70, p < .001, partial η^2 = .09), and instruction condition (F(2, 364) = 7.04, p = .001, partial η^2 = .04) main effects remaining significant, and their interaction remaining non-significant (F(2, 364) = 1.46, p = .233, partial η^2 = .01).

While controlling for age, the planned contrasts still showed a statistically significant difference in performance in the prospective memory task in the control group between the easy and the difficult conditions, F(1, 364) = 19.44, p < .001, providing further support to P1. There was a statistically significant difference in PM performance between the control condition and Implementation Intentions + Imagery in the difficult version, (F(1, 364) = 10.87, p = .001), supporting P2. Additional, a statistically significant difference was found between Implementation Intentions + Imagery and Implementation Intentions only in the difficult version, F(1, 364) = 6.99, p = .009). There was no statistically significant difference between control and Implementation Intentions only in the difficult version (F(1, 364) = 0.57, p = .450), supporting P4.

In the easy version there was no statistically significant difference between control and Implementation Intentions + Imagery ($F(1, 364) = 1.88$, $p = .171$), adding further support to P3, nor between control and Implementation Intentions ($F(1, 364) = 0.02$, $p = .896$), adding further support to P5. Furthermore, no significant difference was found between Implementation Intentions and Implementation Intentions + Imagery in the easy version of the task ($F(1, 364) = 2.11$, $p = .147$).

The study also explored whether participants' distraction level affected their PM performance. No correlation was found between distraction level and PM score, $r = -.03$, $p = .588$. As such, no further analyses were conducted controlling for the effects of distraction levels on PM performance.

5.4.7 Discussion

The results suggest that brief implementation intentions supported by the relevant imagery have a similar effect to the use of conventional implementation intentions in a prospective memory task, providing support to H3, that implementation intentions can be induced successfully through brief image-based messages. As predicted in P2, in this experiment, implementation intentions and imagery increased the participants' performance significantly compared to the control, but only in the more difficult version of the PM task. These findings are similar to the findings of McFarland and Glisky (2012), Meeks and Marsh (2009) and Rummel et al. (2012), where implementation intentions had a significant effect on a task with an added cognitive dimension.

As predicted in P1, scores in the control condition were significantly lower in the difficult task than in the easy task. In the easier version, PM scores were uniform across all three conditions, a finding consistent with P3 and P5, that Implementation Intentions + Imagery, respectively Implementation Intentions only would not be significantly different from the control condition, in the standard version of the task. In the standard version of the task, only a small and non-significant improvement (over the control condition) due to implementation intentions and imagery was found, suggesting that, as McFarland and Glisky (2012) argue, if the task is not demanding enough, there may not be a clear benefit of implementation intentions and imagery. The current findings thus support this assumption, considering that implementation intentions appeared to be particularly effective for the more challenging version of the task. It may be that implementation intentions are particularly effective in the case of challenging behaviours or tasks, and less effective in cases where individuals are already performing well. The lack of significant effects in the easier version suggests that Experiment 1 may have been affected by a ceiling effect. Given that individuals were already performing well, with very high accuracy

rates, there may have not been much space for implementation intentions to provide clear benefits in performance. The findings of this study thus support the ceiling effect explanation for the null results obtained in Experiment 1, and not the alternative explanation that this format of implementation intentions is not effective.

As predicted in P4, in the difficult version, there was no statistically significant difference between the implementation intentions and the control condition. However, implementation intentions and imagery were significantly different from the control condition, and there was also a significant difference between implementation intentions and imagery, and implementation intentions alone. This demonstrates that a brief form of implementation intentions was not effective on its own. Visual imagery is necessary to reproduce the mechanism of conventional implementation intentions in a marketing form. Fennis et al. (2011) argue that vivid narrative imagery is necessary for implementation intentions in a marketing format that does not include explicit instructions, to be effective, and to enhance the cognitive accessibility of relevant cues and behavioural responses. Their findings, related to a form of implementation intentions supported by narrative imagery, provide support to this assumption. The findings in the present study also support this assumption, in the context of brief implementation intentions supported visual imagery provided via the use of pictures. Given that the visual format of implementation intentions, researched in this study, is highly suitable for use in marketing, it could make it possible for the benefits of implementation intentions to be used on a wide scale. The research also supports findings on the role of mental imagery in enhancing implementation intentions (Knäuper et al., 2009). Although the majority of the research on the role of imagery in enhancing implementation intentions' effectiveness provides instructions to participants for both the imagery, and the implementation intentions components (Knäuper et al., 2009), the current study extends these findings to indicate that simply showing the imagery and the implementation intentions sentence has similar effects on behaviour.

The PM literature suggests that PM performance is linked to the strength of the association between a target and an intended action; the stronger the link between the target and the intended action, the higher the PM performance (McDaniel et al., 2004). Implementation intentions are also shown to support the creation of a strong link between a cue and an intended action (Gollwitzer, 1999). The current findings suggest that implementation intentions in the brief visual form also produce a strong association between a cue and an action, and enhance PM performance. Furthermore, this link between a cue and an action, created by the implementation intentions, is argued to lead to the automatic activation of the behaviour when encountering the specific cue (Aarts et al., 1999; Webb & Sheeran, 2007). In the context of

prospective memory, it is hypothesised that if implementation intentions cause the triggering of the intended action to happen automatically, there should be no negative effects on performance in the ongoing tasks (Breneiser, 2009). In this experiment, even though brief implementation intentions with imagery helped increase PM performance, they did not alter performance in the ongoing trivia task. The prospective memory task became less resource demanding, enabling participants to use the same amount of cognitive resources on the ongoing task. This suggests that, similar to conventional implementation intentions, implementation intentions, in the format explored in this experiment, provide for automatic, reflexive activation of the intended behaviour, when prospective memory cues are encountered.

5.5 Experiments 3, 4A and 4B

While Experiment 1 raised questions regarding the usefulness of implementation intentions in a brief visual form, Experiment 2 provided an explanation for the lack of results from Experiment 1, along with evidence that this format of implementation intentions is effective at enhancing behaviour. Brief implementation intentions alongside vivid pictures were shown to be as effective as the conventional version and lead to the automatic activation of behaviour upon encountering the cue in a controlled environment. The results of Experiment 2 suggest that implementation intentions can be used successfully in a brief format suitable for marketing application. The next question that needs to be addressed is whether implementation intentions, used in a marketing format, are effective at enhancing pro-environmental behaviour. The evidence on the role of conventional implementation intentions in pro-environmental behaviour is limited. Pro-environmental behaviour research has employed the conventional form of implementation intentions in two studies. Although Bell et al. (2016) and Bamberg (2003) show promising results for implementation intentions' effects on pro-environmental behaviour, the method employed is not practical for a marketing context as it involves effort from the participants to form their own implementation intentions sentences. In addition, Fennis et al. (2011) attempt to work with a marketing relevant form: participants reading a text, and the behaviour of sustainable product buying. One of the limitations of this study is the use of a long text format that allowed participants ample time to read the message. It is insightful to explore other marketing contexts more versatile and where the formation of implementation intentions is more limited, which is what the current set of studies focuses on. Furthermore, Fennis et al. (2011) focus on self-reported behaviour, whilst this set of studies explores the effects of visual imagery and implementation intentions on both self-reported and objectively measured behaviour. The field experimental approach employed has the benefit of helping to understand the effects of implementation in real-life settings, providing more ecologically valid results.

The three studies explore the recycling of plastics. Several reasons motivate this choice. Plastic use has increased significantly in the last 60 years, with 4% of world oil being used for producing plastic, and another 4% being used for its manufacture (Hopewell, Dvorak, & Kosior, 2009). Plastics do not decompose, but instead accumulate in landfills, and the only way that plastic waste can be eliminated is incineration, which causes greenhouse gas emissions (Geyer, Jambeck, & Law, 2017). Furthermore, the contamination of oceans, freshwater and other terrestrial habitats with plastic has been increasingly reported, with negative impacts over wildlife and ecosystems (Geyer et al., 2017; Hopewell et al., 2009). The production and disposal of plastics are thus highly environmentally damaging and unsustainable (Hopewell et al., 2009). On the other hand, plastic recycling has significant environmental benefits (Wäger & Hischier, 2015). Recycling has been shown to have an environmental impact 4 times lower than incineration in a waste incineration plant, and 6 to 10 times lower than the production of virgin plastics, as it reduces the emissions resulting from the extraction and processing of oil, and of plastic manufacturing (Wäger & Hischier, 2015). Recycling plastic is therefore an important pro-environmental behaviour that can significantly contribute to reducing greenhouse gas emissions (Hopewell et al., 2009).

Literature suggests numerous obstacles that need to be overcome in plastic recycling. Recycling involves significant effort, inconvenience and time being key reasons people cite for not recycling (Perrin & Barton, 2001; Tonglet, Phillips, & Bates, 2004), as well as "being too busy with other preoccupations" (Jesson, 2009). Because recycling requires individuals to expend extra time sorting and finding recycling bins, this suggests self-control plays a role in the process. Another important obstacle to recycling is distance to recycling facilities, which may increase perceptions regarding the difficulty of this behaviour (Chen & Tung, 2010; Garcés et al., 2002; Klöckner & Oppedal, 2011; Lange, Brückner, Kröger, Beller, & Eggert, 2014). Self-control is required for an individual outside the home environment to identify the correct recycling bin and dispose of the plastic item appropriately, especially as general waste/landfill bins are much more widely available. This means that individuals have more temptations, or opportunities to not be environmentally-friendly. The difficulty of recycling is also found to be a significant factor affecting people's recycling (Lindsay & Strathman, 1997). Finally, habit is also found to influence recycling (Knussen et al., 2004). Habits, or repeated behaviours that become automatic responses (Galla & Duckworth, 2015), are seen to be one of the key obstacles to recycling, as individuals' unsustainable practices regarding product disposal tend to be habitual (Knussen & Yule, 2008). In their study, Knussen and Yule (2008) find that those who did not have recycling habits tend to have alternative habits of disposing of recyclables in the general waste bin, and that existing unsustainable habits posed a barrier to change. Altogether,

these obstacles indicate that recycling is typically not an easy behaviour, lending it suitable to a self-control approach. Implementation intentions should thus help increase plastic recycling.

As in Experiment 2, in Experiments 3, 4A and 4B, the format chosen for imagery is that of a picture, namely in a poster using imagery and implementation intentions. The reason for this choice was that posters are a common medium used in marketing, and in particular in social marketing and on university campuses (Potter et al., 2009), where two of the field experiments take place. Typically social marketing on campuses relies on posters (Mattern & Neighbors, 2004), and in the university where two of the experiments take place it is commonplace that posters addressing various issues can be found. In addition, the picture format is versatile, allowing for the quick dissemination of marketing messages (Potter et al., 2009). The poster format was also particularly suitable for depicting the behaviour of recycling plastic bottles and plastic cups.

5.6 Experiment 3

The current study aims to explore H4, that implementation intentions supported by imagery, used in a marketing format, are effective in promoting pro-environmental behaviour. The study thus addresses the usefulness of implementation intentions in a visual form in promoting plastic bottle recycling. Based on findings from Experiment 2, only the implementation intentions + vivid imagery condition was compared to a control, as the implementation intentions sentence was shown to have no effects on its own. This study was designed to understand whether the experimental manipulation led to an increase in individual recycling behaviour, in comparison to a control group.

The experiment took place over a period of 6 weeks, in a classroom setting within a Scottish University. Behaviour was measured at Time 1 (baseline), and at Time 2 (post-intervention) for both the control and experimental group. An experimental manipulation was implemented between Time 1 and Time 2, via a poster. This type of pretest-posttest design (Rausch, Maxwell, & Kelley, 2003) was also employed by de Nooijer et al. (2006) and Harris et al. (2014), who measured the effect of a conventional implementation intentions manipulation on fruit consumption, compared to a control group, including baseline fruit consumption as a covariate. The experiment aims to explore differences in change from the baseline to post-intervention. As such, the analytical strategy employed was ANCOVA with Behaviour at Time 1 as covariate, as ANCOVA has been shown to be particularly suitable for exploring whether groups change differently from the pretest to the posttest, which the current study addresses

(i.e., group differences in change from Time 1 to Time 2), and is a more statistically powerful and precise analytic method than ANOVA in such designs (Rausch et al., 2003).

Furthermore, the study aims to understand whether it is necessary for individuals to see the poster in order for the implementation intentions to be effective, or whether they can work implicitly to influence individuals. Previous implementation intentions studies have required participants to engage with the implementation intention, and in Experiment 2, participants were asked to actively look at the image. Looking at the image therefore appears to be a minimum requirement for implementation intentions to work in a brief format in a marketing setting. Therefore, a question asking whether participants remembered seeing the experimental image on the screen was included in the experiment at Time 2. There is to date no data to suggest that an image of implementation intentions can unconsciously influence participants. This question would allow to ascertain whether a minimal level of processing is required (i.e., noticing the poster) in order for implementation intentions and imagery to be effective, or whether implementation intentions and imagery have potential implicit effects. The processes that enable the effectiveness of implementation intentions involve raising the mental accessibility of the situational cues and appropriate behavioural responses, and forging a strong link between the cue and the response (Gollwitzer, 1999). Research indicates that constructs such as goals, traits or values can be made mentally accessible by features of one's environment (Aarts et al., 1999; Chartrand & Bargh, 1999), with immediate and long-term effects on behaviour (Chartrand & Bargh, 1999; Lowery, Eisenberger, Hardin, & Sinclair, 2007). However, for the Implementation Intentions + Imagery to influence behaviour unconsciously, the poster would need to not only enhance the mental accessibility of the cue and the situation, but also to create a strong link between these. Past research has focused on raising the accessibility of, and activating a single mental construct at a time (e.g., Aarts et al., 1999; Chartrand & Bargh, 1999; Lowery et al., 2007), rather than two constructs (cue and response), as well as the creation of a link between them, which is required in implementation intentions (Gollwitzer, 1999). Therefore, it is unclear to what extent unconscious mental activation can support all the processes involved in implementation intentions. It was predicted that implementation intentions and imagery will be effective at enhancing recycling in comparison to a control group, when they have been seen by the participants (P6) and that implementation intentions and imagery will not lead to an increase in recycling, relative to a control, if they have not been seen by the participants (P7).

5.6.1 Participants

Participants were recruited from the tutorials of a 2nd year course in the School of Management, of the aforementioned university. The study was conducted in 3 stages: initial data collection (Time 1), manipulation and final data collection (Time 2). Although 123 participants

participated in Time 1 and 126 participants filled in the questionnaire at Time 2, due to variation in attendance between the three stages (initial data collection – Time 1, manipulation, final data collection – Time 2), 66 participants remained, who had been present during all 3 stages. They were aged 18-23; 29 were male and 37 female.

5.6.2 Procedure

Informed consent was given prior to the experiment, which was approved by the University of St Andrews Ethics Committee. Participation was on a voluntary basis. Participants filled in a paper questionnaire (duration of approx. 5-10 minutes) and were offered candy and chocolate in return for their participation. Participants filled in the questionnaire at Time 1, experienced the manipulation, and filled in the questionnaire again, at Time 2.

The form for both Time 1 and Time 2 included an individual code that participants were asked to create, to anonymously match the answers in the first stage to those in the last stage. At Time 1, participants filled in a self-reported measure of plastic bottle recycling behaviour, along with additional behaviours that would prevent the participants from guessing the true purpose of the study. All the behaviours, including recycling, were measured on a frequency scale from 0 (0 times per week) to 5 (more than 5 times per week).

The final data collection, at Time 2, included the same self-reported measure of plastic bottle recycling behaviour, followed by a check to determine whether participants had been present at the tutorials where the manipulation occurred. After completing the self-reported behaviour measure and the attendance check, participants were also asked whether they had noticed any image on the screen in the previous tutorials, to understand whether implementation intentions need to be seen in order to be effective.

In the manipulation stage, tutorial rooms were assigned to one of two conditions, namely the experimental condition or the control condition. Due to the limitations of the experimental setting, all participants in a given tutorial room were exposed to the same condition. However, tutorial rooms were randomly allocated to conditions, and students had been randomly allocated to a tutorial room at the beginning of the semester, thus maintaining a random allocation to conditions within the constraints of the sample.

5.6.3 Manipulation

The experimental manipulation involved an image being displayed on the projector screen in each tutorial room. In the experimental condition, implementation intentions and imagery were manipulated via an image shown on the projector, with the implementation intentions text, and relevant visual imagery (Figure 8). In the control condition, an unrelated, abstract image was

shown on the screen. Its aim was to maintain a similar as possible environment in the control and the experimental rooms, with the projector screen being turned on in both conditions.

Data were collected by the researcher, who was a tutor on the module, and by other tutors who also led tutorials on the same module. The tutors were given instructions to not prompt the students to look at the screen and to not mention or discuss the image during the tutorial. Based on the researcher's and the assistants' observations, no questions were asked about the image in all but one tutorial group. One student in the control group inquired about the image; the experimental assistant responded that she was unaware of the purpose of the image. Although no other inquiries were made, the experimental assistant and the researcher observed some of the students glancing at the screen.

The implementation intentions manipulation was pretested qualitatively with 7 participants, who confirmed that it was vivid, clear and similar in format to marketing posters.

Figure 8. Implementation Intentions + Imagery condition

The chosen control image was an abstract art image[10] (Kim, 2009) that included the colours in the experimental image. This was chosen to avoid unintentionally activating other constructs that may affect the results, as research indicates images can activate goals or values (Hahnel et al., 2014), or unconsciously prime behaviours (Lin & McFerran, 2016).

5.6.4 Timeline

Responses at Time 1 were collected in the 5th and 6th weeks of teaching. The manipulation stage took place in weeks 8 and 9, immediately after a two-week spring break. Although the manipulation had been designed to be applied in a single week, due to poor attendance following the spring break, the manipulation stage was extended to the following week. Therefore, some students (33 in the Implementation Intentions + Imagery condition saw the manipulation twice and 7 saw it once, and 11 in the control condition saw it twice and 15 saw it once) were exposed to the manipulation twice. The final data collection took place in week 10 of the semester. A timeline of the data collection process can be seen in Figure 9.

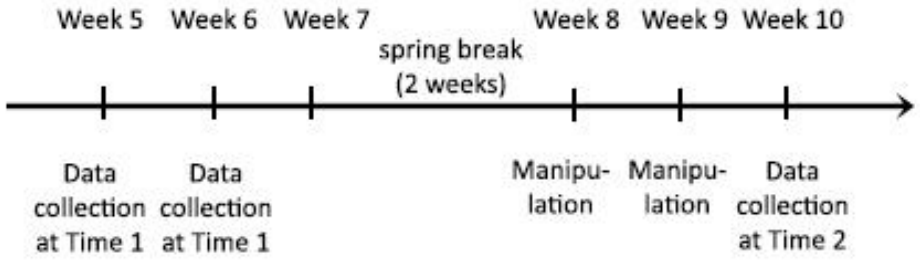


Figure 9. Timeline for data collection

5.6.5 Results

To confirm the random assignment of participants to the two conditions, an independent samples T-test was conducted to check for differences between the two conditions in Behaviour at Time 1. No significant differences were found in plastic recycling behaviour at Time 1, between the control and the experimental condition, $t(64) = -0.04$, $p = .970$. The means and standard deviations can be seen in Table 55. This suggests that students assigned to the control and implementation intentions conditions had similar rates of recycling prior to the manipulation.

[10] The image can be viewed at: https://artsandculture.google.com/asset/qQE6g0Hbam9Nng

Table 55. Descriptive statistics for recycling at Time 1 and Time 2, by condition

Condition	Plastic bottles recycled – Behaviour Time 1		Plastic bottles recycled – Behaviour Time 2	
	M	SD	M	SD
Control (N = 26)	2.12	1.40	2.04	1.48
Implementation Intentions + Imagery (N = 40)	2.10	1.71	2.28	1.75

An ANCOVA was conducted to assess the effects of condition on Behaviour at Time 2, while controlling for Behaviour at Time 1. A test of the assumption of homogeneity of slopes revealed no significant interaction between Behaviour at Time 1 and condition, $F(1, 62) = 0.16$, $p = .695$, partial $\eta^2 = .002$. The ANCOVA revealed no statistically significant effect of condition on behaviour, $F(1, 63) = 0.69$, $p = .408$, partial $\eta^2 = .01$, with Behaviour at Time 1 as covariate. Behaviour at Time 1 was significantly related to Behaviour at Time 2, $F(1, 63) = 62.27$, $p < .001$. Comparing the estimated marginal means showed that the individuals in Implementation Intentions + Imagery condition recycled more (M = 2.28) than those in the control condition (M = 2.03).

Due to the assumption that implementation intentions have to be seen and, at least to a minimal extent, be processed in order to be effective, a further analysis was conducted comparing the effects of the manipulation for those who noticed the poster on the screen it in the Implementation intentions + Imagery condition, to those who did not notice it in the Implementation intentions + Imagery condition, and to the control condition.

To check whether participants may have remembered seeing the poster due to other reasons besides the experimental manipulation, such as a higher interest or engagement in recycling, a check for any significant differences in recycling behaviour at Time 1 between the students who had noticed the manipulation in the Implementation intentions + Imagery condition, and those who had not, was conducted using an ANOVA. At Time 1, no significant differences were found in plastic recycling behaviour between the three groups (control, Implementation intentions + Imagery who noticed the poster, Implementation intentions + Imagery who did not notice the poster), $F(2, 63) = 0.05$, $p = .949$. This indicates that, prior to the implementation intention manipulation, participants who did not remember seeing the implementation intentions manipulation at Time 2 were recycling at similar rates to those participants who remembered

seeing it, and to those in the control condition. The mean and standard deviations for Time 1 and Time 2 can be seen in Table 56.

Table 56. Descriptive statistics for recycling at Time 1 and Time 2, for the three groups

Condition	Plastic bottles recycled – Behaviour Time 1		Plastic bottles recycled – Behaviour Time 2	
	M	SD	M	SD
Control (N=26)	2.12	1.40	2.04	1.48
Implementation Intentions + Imagery who did not notice the poster (N=16)	2.00	1.75	1.69	1.82
Implementation Intentions + Imagery who noticed the poster (N=24)	2.17	1.71	2.67	1.63

Using the same breakdown of the groups (control, Implementation intentions + Imagery who noticed the poster, Implementation intentions + Imagery who did not notice the poster), an ANCOVA with Behaviour at Time 1 entered as covariate was conducted. A test of the assumption of homogeneity of slopes revealed no significant interaction between Behaviour at Time 1 and condition, $F(2, 60) = 0.67$, $p = .502$, partial $\eta^2 = .02$. The ANCOVA, revealed no statistically significant effect of condition on Behaviour at Time 2, $F(2, 62) = 3.08$, $p = .053$, partial $\eta^2 = .09$. The covariate, Behaviour at Time 1, was significantly related to Behaviour at Time 2, $F(1, 62) = 65.00$, $p < .001$.

Planned contrasts were conducted, considering that a priori predictions were tested (Field, 2018). To test P6, a planned contrast was conducted between those in the Implementation Intentions + Imagery condition who noticed the poster, and the control condition. No significant difference between the Implementation Intentions + Imagery who noticed the poster group, and the control group was found, $F(1, 62) = 3.34$, $p = .072$. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an alpha level of .05, and an effect size $f = .231$, a power level of 46% was obtained for this contrast. To test P7, a planned contrast between the Implementation Intentions + Imagery condition who did not notice the poster, and

the control condition was conducted. There was no statistically significant difference between the Implementation Intention + Imagery who did not notice the poster group, and the control group, $F(1, 62) = 0.54$, $p = .464$. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an alpha level of .05, and an effect size $f = .095$, a power level of 12% was obtained for this test. Additionally, a statistically significant difference between the Implementation Intentions + Imagery who noticed the poster group, and the Implementation Intention + Imagery who did not notice the poster group was found, $F(1, 62) = 5.41$, $p = .023$. Comparing the estimated marginal means showed that the individuals in the Implementation Intentions + Imagery who noticed the poster group recycled the most ($M = 2.62$), compared to the Implementation Intention + Imagery who did not notice the poster ($M = 1.76$) and the control group ($M = 2.03$).

This finding suggests that the implementation intention enhanced behaviour only when people processed the imagery to a sufficient extent to recall seeing the image. This provides additional evidence for the usefulness of implementation intentions in a marketing format. Seeing and processing a poster using implementation intentions is needed for implementation intentions in this brief form to influence behaviour. In the current study, implementation intentions in this brief form did not appear to influence behaviour implicitly – participants who did not process the image to the extent required to remember seeing it were not affected by the manipulation.

Finally, because some of the participants were exposed to the manipulation twice, it would have been insightful to explore whether seeing the manipulation twice affected recycling behaviour at Time 2, compared to seeing the manipulation once. However, 33 participants were exposed to the Implementation Intentions + Imagery manipulation twice, and 7 participants were exposed to the Implementation Intentions + Imagery manipulation once. Given the discrepancy between the sample sizes, it was not possible to conduct a meaningful comparison between the recycling behaviour at Time 2 of those who were exposed twice to the manipulation, and the recycling behaviour at Time 2 of those who were exposed once.

5.6.6 Discussion

This study indicates that implementation intentions alongside vivid visual imagery can improve plastic bottle recycling compared to a non-vivid control. In this particular case there was no need for an extensive manipulation involving participants repeating the implementation intentions. However, as predicted in P6 and P7, implementation intentions and imagery enhanced recycling in comparison to a control group, when they were seen by the participants, but not when they were not seen by the participants. This indicates that noticing the poster on the screen was the key factor that underlined the effectiveness of the manipulation – in order to

influence behaviour, brief implementation intentions and imagery have to be noticed. The presence of a poster using this format of implementation intentions did not influence participants unconsciously.

The results suggest that presenting an implementation intention alongside a relevant image should make it possible to utilise the benefits of implementation intentions in a wider range of pro-environmental behaviours, beyond recycling. Although the results in this study were not statistically significant, the findings show the potential of implementation intentions to be effective in a marketing context, an issue future research should further explore. The effect size for the contrast between the implementation intentions condition who remembered seeing the manipulation, and the control condition (f = .231) was comparable with the effect size obtained in Experiment 2, for the contrast between implementation intentions + imagery, and the control condition, in the difficult version of the task (f = .173), which was statistically significant. A potential explanation for the non-significant results is that the current study was limited by the small sample size (26 participants in the control condition, 24 participants in the implementation intentions condition who remembered seeing the manipulation, and 16 in the implementation intentions condition who did not remember seeing the manipulation). This led to reduced statistical power, which may have limited the likelihood of detecting a significant difference between the implementation intentions condition who remembered seeing the manipulation, and the control condition. Statistical power was 46% in this case, whereas Cohen (1988) recommends achieving 80% statistical power. The small sample size may have also reduced the reliability and generalisability of the findings, which suggests that further evidence is required to assess the usefulness of this brief form of implementation intentions. Finally, this study also relies on a self-reported measure of past behaviour, rather than a directly observable behaviour measure, which would provide more accurate data. Self-reported measures of behaviour may be subject to biases and inaccuracies, given that they rely on individuals' subjective approximation of their own behaviour (Schwarz, 1999).

5.7 Experiments 4A and 4B

Experiments 4A and 4B aim to provide further support to H4, focusing on an objective behaviour measure. The two experiments explore the use of implementation intentions and visual imagery in a poster form to promote plastic cup recycling in a field experimental approach. As in Experiment 3, only the implementation intentions + vivid imagery condition was compared to a control, as the implementation intentions sentence was shown to have no beneficial effects on its own in Experiment 2.

Experiment 4A took place in a professional development unit of a Scottish University. Experiment 4B took place in a small gym in a Scottish city. Both locations were selected due to being relatively contained and allowing for tighter control over the environment of the participants. The two experiments utilised the same poster depicting implementation intentions and the act of recycling. The poster was qualitatively pre-tested on a sample of 14 participants, who confirmed that the image accurately depicted the action of recycling an empty plastic cup, and that it was vivid and clear. The poster featured the same recycling bin that was utilised in the experiments, and the same type of plastic cups available in the experimental locations.

5.8 Experiment 4A

Experiment 4A explores plastic cup recycling in a professional development unit. The professional development unit was situated in an isolated wing of a Scottish university building. The access in this room was limited to participants in professional development workshops taking place in the university, and to workshop leaders. Outside times when workshops take place, the room is closed to the public. Workshop leaders and participants vary with each training session, due to the wide range of workshops taking place. The workshop room provides jugs of water and plastic cups to the participants. Due to the separated nature of the room, participants use and dispose of the plastic cups provided in the room. Access is limited in the building, and the only other bins accessible are on a different level, meaning that it would be unlikely that individuals would dispose of plastic cups from the experimental location in different locations.

5.8.1 Participants

Participants were workshop attendees and workshop leaders. The workshops are open only to university staff and postgraduate students. Due to the nature of the field experiment, no other background data could be collected about the participants. The experiment was approved by the University of St Andrews Ethics Committee.

5.8.2 Manipulation

The experimental manipulation involved the placement of an A2 poster at eye-level, on the wall behind the counter where plastic cups were available. The poster involved an implementation intention and an image of a plastic cup being thrown into the recycling bin, which can be seen in Figure 10.

Figure 10. Implementation Intentions + Imagery poster

5.8.3 Procedure

Two general waste bins and a plastic recycling bin were available in the room. One of the general waste bins was closest to the plastic cups and water jugs (right side). The plastic recycling bin was located to the left of this general waste bin. Another general waste bin was located to the left side of the plastic cups, approximately 2 meters away, as it can be seen in Figure 11. Two general waste bins meant that participants had more opportunities to dispose of the cup unsustainably, similar to typical real-world environment, where participants have significantly more opportunities to dispose of plastic unsustainably than to recycle it. Particularly, lower opportunities for recycling, are cited in the literature as an obstacle to recycling (Wagner, 2013).

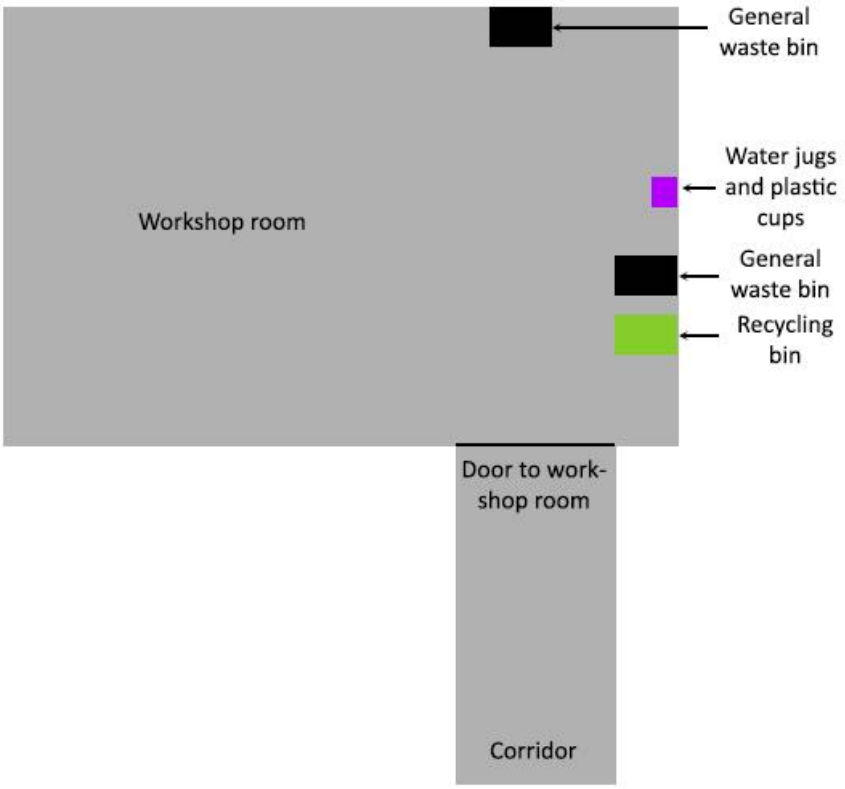


Figure 11. Layout of the experimental location in Study 4A

Janitorial staff were informed that a study was running, and that the contents of the general waste and recycling bin would be collected by the researcher, so as to ensure the bins were not interfered with. As the daily cleaning occurs outside workshop times, this meant that janitors would not get in contact with workshop participants, and thus there was no danger of participants accidentally finding out about the study. The researcher visited the room daily after the end of workshops, so as not to make workshop leaders or attendees aware of the experiment. The number of plastic cups in the general waste bins, and in the recycling bin was counted every day, to determine the percentage of cups that were recycled out of the total number of cups used.

Block 1 of data collection represented a control for plastic cup recycling. Data was collected for 13 working days to assess the plastic recycling rates in the room. The manipulation took place in Block 2 and lasted for 17 working days.

5.8.4 Results

Overall 136 plastic cups were gathered, 68 in Block 1 and 68 in Block 2. Data revealed an increase in recycling, from 20.5% to 51.4% of the total number of cups (Appendix C). Chi-square analysis revealed that the increase was statistically significant ($\chi^2(1, N = 138) = 14.07$, p

< .001). The percentage of plastic cups recycled increased by 150% when the poster was placed in the experimental location. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an effect size w = .322, and an alpha level of .05, a power level of 96% was obtained for this study.

The number of plastic cups in each bin per condition can be seen in Table 57.

Table 57. Number of plastic cups in each bin per condition

Condition	Cups in recycling bin	Cups in general waste bins
Control	14	54
Implementation Intentions + Imagery	35	33

5.8.5 Discussion

Experiment 4A indicates that implementation intentions used in a poster format alongside vivid visual imagery can effectively improve plastic cup recycling, adding further support to H4. The manipulation helped increase recycling rates from under a quarter of recycled cups, to over a half of the cups being recycled. In other words, the manipulation increased recycling by 150%. This study thus provides evidence that the brief form of implementation intentions is effective at promoting recycling. Furthermore, by employing a field experimental setting and an objective behaviour measure, this experiment overcomes problems of past research based on self-reported behaviour (Fennis et al., 2011). This finding further supports the use of implementation intentions to influence green behaviour, and further demonstrates that an extensive implementation intention manipulation is not required to influence green behaviour. Posters using brief implementation intentions, along with visual images were, in this case, able to enhance green behaviour.

5.9 Experiment 4B

Experiment 4B is designed to further support the findings of experiment 4A, in a different location with a different set of participants. Experiment 4B took place in a Scottish gym, with a similar design to experiment 4A. The gym was in a contained location, part of a sports complex. The gym has its own water fountain and also provides plastic cups to the gym users. Due to the separated nature of the gym, users use and dispose of the plastic cups provided in the same area. Furthermore, as the gym is located at one end of the building, it is unlikely that people could

dispose of cups from other areas in this area. This helped ensure that only cups used in the experimental area would be disposed of in the experimental area.

5.9.1 Participants

Participants were gym users. Due to the nature of the field experiment, no other background data could be collected about the participants. The experiment was approved by the University of St Andrews Ethics committee.

5.9.2 Manipulation

The experimental manipulation involved the placement of the same A2 poster used in Experiment 4A at eye level, above the water fountain and next to the plastic cup dispenser.

5.9.3 Procedure

The two clearly marked (recycling and general waste) bins were placed in the gym; the full layout of the gym area where the experiment took place can be seen in Figure 12. The general waste bin was placed next to the water fountain. The recycling bin was placed approximately 2 meters away from the general waste bin (Recycling bin location 1, as seen in Figure 12), in order to increase the inconvenience of the recycling behaviour and mimic one of the real-world obstacles associated with recycling. As the literature indicates, people often cite distance to recycling facilities and inconvenience as reasons not to recycle (Garcés et al., 2002; Salonen & Åhlberg, 2013). Cleaning staff were informed that someone else would collect the bins, but not that a study was running. This was done to avoid making the participants aware of the study, as cleaning staff in the gym sometimes interact with gym users. One of the researchers emptied the bins at the same time every day.

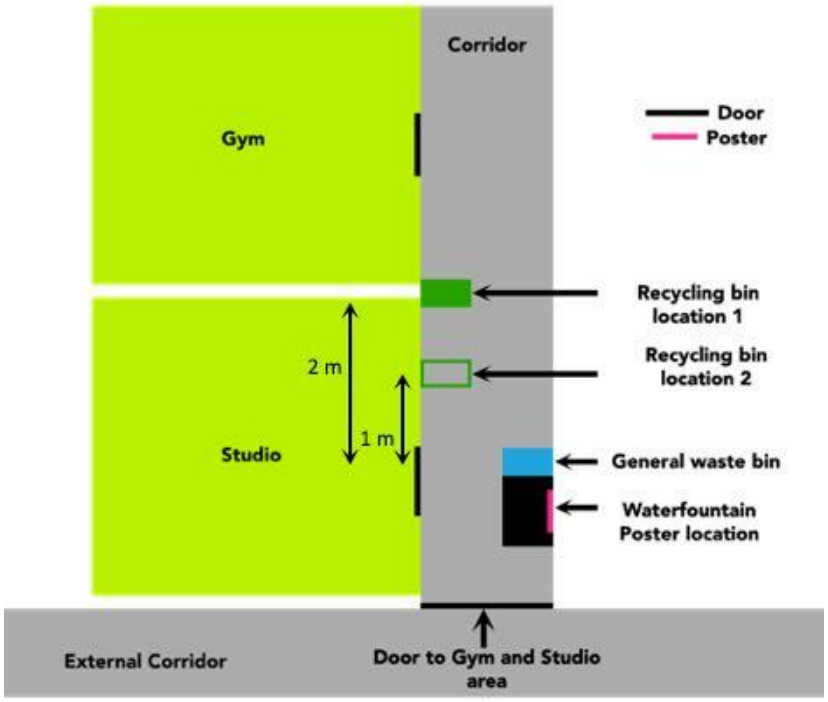


Figure 12. Layout of the experimental location in Study 4B

Note: Recycling bin location 1 = location between Days 1-12. Recycling bin location 2 = location between Days 14-16.

Data was collected in 2 blocks. Block 1 was a baseline for the recycling rates in the gym, and was interpreted as control. Block 1 lasted for 8 days (Days 1 - 8). The manipulation took place in Block 2 and was intended to last for an equal number of days. During Days 9 - 12, data was collected without any issues. However, due to gym staff interference with the bins, cups collected in the last 4 days of Stage 2 were not included in the main analysis regarding the effectiveness of implementation intentions. On Day 13, the researcher found that the recycling bin had been switched with the general waste bin (the recycling bin was moved from Recycling bin location 1 to the location of the general waste bin, next to the water fountain; the general waste bin was moved to Recycling bin location 1, approximately 2 meters away from the fountain). The researcher switched them back to their intended positions (the recycling bin was moved back to Recycling bin location 1, and the general waste bin was back to its position next to the water fountain). However, during Days 14 - 16, the recycling bin was moved again, this time approximately 1 meter closer to the poster (Recycling bin location 2). The general waste bin remained in its intended position, next to the water fountain, during Days 14 - 16. The

researcher collected data for an additional day (Day 17), and switched the bins intentionally on that day (the recycling bin was moved next to the water fountain, and the general waste bin was moved to Recycling bin location 1), to see if any changes in recycling would occur.

The bags collected were stored securely for the duration of the experiment. The number of plastic cups in each bin was counted following the end of the experiment. The number of plastic cups in the general waste bin, and in the recycling bin were assessed, in order to calculate the percentage of cups recycled from all the cups used.

5.9.4 Results

In total, 811 cups were collected during the data collection period (Days 1-17). The number of cups at the baseline, during the manipulation, as well as during the tampering of the bins can be seen in Table 58.

Table 58. Numbers of cups recycled and not-recycled by time period

Time period	Cups in recycling bin	Cups in general waste bin
Days 1-8 (Baseline)	35	380
Days 9-12 (Implementation Intentions + Imagery)	23	154
Days 14-16 (Implementation Intentions + Imagery; recycling bin moved to Location 2)	24	108
Days 13 and 17 (Implementation Intentions + Imagery; recycling and general waste bins switched)	76	11

Further analyses were conducted to compare bin data during the manipulation, to understand how the bin tampering affected recycling relative to the period the bins were in their intended locations.

Chi-square analysis revealed no significant difference between the number of cups collected during Days 9-12 and the number of cups collected during days 14-16, when the bin was 1 meter away from the poster ($\chi^2(1, N = 309) = 1.58, p = .209$). However, there was a statistically significant difference between Days 9-12, and Days 13 and 17, when the two bins were switched ($\chi^2(1, N = 264) = 137.62, p < .001$). The recycling rate increased from 13% to 87.4%.

5.9.4.1 Baseline vs. Implementation Intentions + Imagery

Further analysis was conducted to compare the baseline, with the manipulation during Days 9-12 (when it ran as intended, with no tampering with the location of the bins). This included 592 plastic cups, collected during days 1-12. A total of 415 cups were collected in Block 1, and 177 cups in Block 2. Data revealed an increase in recycling, from 8.4% in Block 1 to 13% of the total number of cups in Block 2. Chi-square analysis revealed that the increase was not statistically significant ($\chi^2(1, N = 592) = 2.92, p = .087$). However, the percentage of plastic cups recycled increased by 55% during the manipulation. A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an effect size w = .072, and an alpha level of .05, a power level of 42% was obtained for this study.

Table 59. Cups in recycling and general waste bin by condition

Condition	Cups in recycling bin	Cups in general waste bin
Control (Baseline)	35	380
Implementation Intentions + Imagery (Days 9-12)	23	154
Implementation Intentions + Imagery (Days 9-12 combined with Days 14-16)	47	262

An additional analysis was conducted, combining the data from Days 9-12 and Days 14-16, considering that there was no significant difference in recycling between these two periods, despite the moving of the recycling bin closer to the plastic dispenser unit (Location 2). This analysis included a total of 724 plastic cups. A total of 415 cups were included from Block 1, and 309 cups from Block 2. Data revealed an increase in recycling, from 8.4% in Block 1 to 15.2% of the total number of cups in Block 2. Chi-square analysis revealed that the increase was statistically significant ($\chi^2(1, N = 724) = 8.10, p = .004$). The percentage of plastic cups

recycled increased by 81% during Days 9-12 and Days 14-16. Table 59 highlights the number of cups in each condition in this period of data collection.

5.9.5 Meta-analysis

To increase statistical power, a meta-analysis was conducted, combining data from Experiments 4A and 4B (Days 1-12). From experiment 4B, only data from Days 1-12 was included, considering that in the rest of the data collection period, the bin locations were altered. The total number of cups in each bin, per condition, can be seen in Table 60.

Table 60. Cups in recycling and general waste bin by condition

Condition	Cups in recycling bin	Cups in general waste bin
Control (baseline)	49	434
Implementation Intentions + Imagery	58	187

In total, 728 plastic cups were included in the meta-analysis, with 483 cups in Block 1, and 245 cups in Block 2. The overall increase in recycling was from 10% in Block 1 to 24% of the total number of cups in Block 2. Chi-square analysis revealed that the increase was statistically significant ($\chi^2(1, N = 728) = 23.73, p < .001$). A post-hoc power analysis using G*Power 3 (Faul et al., 2007) revealed that, with an effect size $w = .181$, and an alpha level of .05, a power level of 100% was obtained for the meta-analysis.

5.9.6 Discussion

Experiment 4B provides additional evidence that indicates that implementation intentions alongside vivid visual imagery can effectively improve plastic cup recycling, in a different environment with different participants. In this case, the experimental manipulation helped improve recycling by 55%. However, the initial recycling rate was lower than in Experiment 4A, indicating that members of the university community were initially more committed to recycling than the gym users, which may also explain the lower increase in recycling observed in the gym. Although the results for Experiment 4B were not statistically significant, a possible explanation for this may be the loss of power due to the much smaller sample size in Block 2 (Cohen, 1992). A major limitation of the experiment was the shorter period of time data was collected in Block 2, mainly due to the context in which the experiment took place. Experiment 4B achieved 42% statistical power, below the recommended 80% (Cohen, 1988). Nonetheless,

when the results of the two experiments were combined in a meta-analysis, the findings indicated that the effect of implementation intentions in a brief marketing format is robust, and the overall statistical power was above the recommended 80% (Cohen, 1988). Taken together, experiments 4A and 4B provide converging evidence that the brief form of implementation intentions is effective at promoting recycling.

Furthermore, a comparison between the recycling rates during the bin tampering periods in the experimental condition indicates that individuals are more likely to recycle when the behaviour is made easy. Although a reduction in distance of 1 meter did not lead to significant changes in recycling, when distance to recycling facilities was significantly reduced, and that to the general waste bin was increased, the recycling rate was six times higher than when participants had to walk approximately two meters to recycle. This is consistent with the literature that suggests difficulty, effort and inconvenience as obstacles to recycling (Perrin & Barton, 2001; Tonglet, Phillips, & Bates, 2004), as well as distance to recycling facilities (Chen & Tung, 2010; Garcés et al., 2002). Although the impact of implementation intentions was much smaller than the impact of the bin reversal, the increase is valuable for behaviour change to be achieved rapidly, given that changes in recycling infrastructure and national policies may take extended periods of time to implement (Wynes & Nicholas, 2017).

5.10 General discussion

This set of studies explores the usefulness of implementation intentions in enhancing pro-environmental behaviour and their applicability in a marketing context. Research in psychology has documented the effectiveness of implementation intentions with a wide variety of behaviours (Gollwitzer et al., 1999). However, the majority of manipulations employ lengthy laboratory procedures that either instruct participants to form their own implementation intentions, or to repeat experimenter-provided implementation intentions. Fennis et al. (2011) attempt to investigate the use of a persuasive form of implementation intentions, in the form of narrative information. However, this study still required individuals to read through a lengthy piece of text, which is not adequate to a large proportion of marketing activities in the contemporary marketing context, where numerous messages compete for people's attention and where individuals do not have ample time to process lengthy information. Furthermore, Fennis et al.'s (2011) study relied on self-reported data.

The current set of studies is the first to explore the use of implementation intentions in a visual, image-based format, in a range of lab and field experiments. This strategy relies on the use of the implementation intentions sentence e.g., "When you have an empty plastic cup, put it in the

recycling bin", alongside with relevant visual imagery of the behaviour in questions, in the form of a picture. This imagery-based strategy is designed to reproduce the mechanisms through which implementations are hypothesised to be effective, without explicitly instructing people to form implementation intentions, or requiring ample time for individuals to process information. This approach also provides a versatile format that would be applicable on a wide scale in marketing, and in particular for promoting pro-environmental behaviour. To provide more ecologically valid data, the chapter employs experiments using both objective measures of behaviour, and self-reports. This set of studies empirically demonstrates that implementation intentions are effective in this short form, providing empirical support for H3, and that they can enhance green behaviour, providing empirical support for H4. The implementation intentions sentence, alongside relevant visual imagery is shown to enhance pro-environmental behaviour and can help reproduce the automaticity element of conventional implementation intentions. Importantly, this is supported by the use of visual imagery. Previous literature indicates that mental imagery can support the formation of implementation intentions (Knäuper et al., 2009). In marketing, mental imagery can be induced using vivid visual imagery (pictures, video) (Petrova & Cialdini, 2005). Therefore, the studies in this chapter employed vivid visual imagery of the behaviour addressed. A key finding is that the use of vivid visual imagery is essential for implementation intentions to be effective in a marketing format. Simply displaying the implementation intentions sentence was shown to have no effects without imagery. However, when used with vivid visual imagery in the form of a picture, implementation intentions were shown to be effective at enhancing both objectively measured and self-reported green behaviour.

Experiments 1 and 2 specifically addressed H3, that implementation intentions can be induced successfully through brief image-based messages, usable in a marketing setting. The studies demonstrate that a brief, visual version of implementation intentions is highly effective in enhancing behaviour, using cognitive tasks typical to implementation intentions research. The aim of these studies is to explore the effectiveness of this form of implementation intentions on a clearly observable behaviour, in a controlled environment without extraneous influences. While Experiment 1 failed to demonstrate any effects of implementation intentions in this format, Experiment 2 showed that this occurred due to a ceiling effect. This suggests that implementation intentions are most useful in behavioural areas that have low rates of adoption, as when performance of a behaviour is already high, implementation intentions are shown to have less clear benefits. Furthermore, Experiment 2 demonstrated that implementation intentions in this format are effective at enhancing behaviour, and can replicate the mental processes through which conventional implementation intentions operate, namely the creation

of a link between a cue and an appropriate behavioural response. In this experiment, it was also shown that an image using only the implementation intentions sentence had no significant effects on behaviour compared to a control, indicating that a marketing form of implementation intentions should be accompanied by relevant, vivid visual imagery.

The next three experiments address H4, that implementation intentions supported by imagery are effective in promoting pro-environmental behaviour, when used in marketing. Experiment 3 expands the findings of Experiment 2 to pro-environmental marketing. Although the findings were not statistically significant, the study provides initial evidence that implementation intentions can be utilised in green marketing, in a field experimental design. Experiment 3 addresses the role of implementation intentions in plastic bottle recycling, demonstrating that implementation intentions used in a poster format with vivid visual imagery enhanced a self-reported behaviour measure. This finding is in line with previous studies that employ conventional implementation intentions to stimulate the purchase of bio-products or energy saving behaviours (Bamberg, 2002; Bell, 2016). In this case it was not necessary to direct participants to form an implementation intention. Simply seeing the implementation intention and vivid imagery on the screen led to increased plastic bottle recycling compared to the control. Although this increase was not significant, the effect size was similar to the one obtained in Experiment 2, for prospective memory performance. One explanation for the lack of significant effects could be the low statistical power achieved in this study, due to the small sample size. This experiment also suggests that implementation intentions in this form need to be seen by the participants. The experimental manipulation did not enhance behaviour for those participants who did not notice the poster on the screen.

Experiments 4A and 4B addressed whether implementation intentions in a brief format can affect real-life behaviour in a field setting, exploring an objective behavioural measure. Similar to the pattern of results obtained for the other studies, this format of implementation intentions enhanced behaviour measured using the number of plastic cups recycled in a university staff development unit (Experiment 4A) and in a gym (Experiment 4B). The results were statistically significant for Experiment 4A, but not for Experiment 4B. A mini meta-analysis of these two studies confirmed the effect of implementation intentions and imagery in a poster format is robust and statistically significant across the combined data.

Importantly, Experiments 3, 4A and 4B were carried out in a field setting, rather than in an isolated laboratory environment. In field designs, people are more likely to be exposed to the competing demands of day-to-day life that may conflict with pro-environmental behaviour. As such, these studies indicate the potential of implementation intentions to enhance behaviour in

different real-life contexts. Experiments 4A and 4B also employ an objective behaviour measure, in order to overcome limitations of past research based on self-reported behaviour (Fennis et al., 2011). This indicates that the marketing format of implementation intentions is robust to extraneous influences, and has the potential to be effective in a range of real-life situations, where behaviour is objectively measured.

An additional, accidental finding emerged in Experiment 4B, due to unexpected tampering with the bins occurred, out-with the control of the researcher. The more inconvenient recycling bin was switched with the convenient general waste bin; thus, recycling became easier, whereas not recycling became more difficult. This led to a substantial increase in recycling, in comparison with the use of the poster alone. Although this suggests that removal of barriers should lead to substantial increases in recycling, these barriers are often related to structural issues such as the distance or availability of recycling facilities (Chen & Tung, 2010; Klöckner & Oppedal, 2011). However, structural changes may take extended periods of time to implement (Wynes & Nicholas, 2017), whereas implementation intentions used in a marketing format could lead to immediate changes in recycling behaviour. This set of studies documents the ability of implementation intentions to increased recycling rates in the presence of structural constraints and obstacles.

Taken together, the current set of experiments demonstrate that implementation intentions may be used to influence behaviour without having to employ explicit instructions, or without having to rely on indirect measures such as intentions. This set of studies thus gathers new evidence on how marketing can support pro-environmental behaviour, using behavioural data from multiple experimental designs implemented in multiple ways: online, in a classroom setting, in a gym setting and in a professional development setting.

Finally, this set of studies extends the findings from Chapter 3, and suggests that supporting individual self-control through the use of a self-control strategy leads to improvements in pro-environmental behaviour, compared to a control. Therefore, these findings support the findings in Chapter 3 regarding the positive role of self-control in pro-environmental behaviour, and the implication that enhancing self-control can benefit one's pro-environmental behaviour engagement.

5.10.1 Contribution

This set of studies extends research on marketing strategies to improve green behaviour, and thus expands the agenda for expanding knowledge on ways in which pro-environmental behaviour can more efficiently be promoted. Implementation intentions are demonstrated to

improve people's performance in a wide range of behaviours (Gollwitzer et al., 1999), and this set of studies provides evidence that they can effectively help individuals be more environmentally-friendly, when used in a short, visual form in a marketing context. Additionally, the findings represent actual behaviour of real individuals and thus need not be inferred from indirect measures such as self-reports or intentions. The key contribution of the current research is thus practical, as this format may be employed as such by policy makers and may be adapted for other pro-environmental behaviours.

This set of studies also adds to the implementation intentions literature, and provides further evidence on the marketing use of implementation intentions, which is currently limited to one study (Fennis et al., 2011). The research provides evidence on the use of a novel format of implementation intentions, based on a brief implementation intention and vivid visual imagery, which has not to date been researched. The conventional implementation intentions manipulation requires participants to form/repeat implementation intentions. The format researched in this set of studies broadens the potential for the benefits of implementation intentions to reach populations on a wide scale if employed to promote pro-environmental behaviour.

The findings also add to a limited number of studies to support the role of implementation intentions as a self-control strategy that can enhance pro-environmental behaviour. The findings thus also answer calls for more research on the role of implementation intentions in consumption related-decisions (Gollwitzer & Sheeran, 2009). The use of self-control strategies to influence pro-environmental behaviour is limited, and this research adds further insights into the potential influence of self-control on pro-environmental behaviour. Finally, the current research also adds further evidence to the role of imagery in implementation intentions, demonstrating that vivid visual imagery can effectively support the processes through which implementation intentions works.

With regards to implications, the chapter provides practical insights for policy makers and social marketers into an effective strategy to promote pro-environmental behaviour. This strategy is highly applicable in a poster format to promote green behaviours on a wider scale, and could potentially be adapted to other behaviours than recycling. For researchers, this research also indicates further avenues for research into the use of implementation intentions in other areas of social marketing, and into possibilities for using implementation intentions in other persuasive formats and contexts.

5.10.2 Limitations and future research

Although the variety of methods was intended to provide more robust results, the research also has limitations. A limitation was the length of both Experiment 1 and Experiment 2, which were kept short compared to studies in the field to maintain participant interest since there was no recompense for this study. In Experiment 2, the minimal length did not allow gaining additional insights on the mental accessibility of the cues, which could help determine more exactly whether the same processes of implementation intentions can be induced in a brief form. Future research on marketing applications of implementation intentions should explore this.

Another important limitation was the reduced sample size in Experiment 3. Due to much fewer than expected students participating in all stages of the experiment and low class attendance, the statistical power of this experiment was reduced. Furthermore, although implementation intentions were shown to be effective even without taking attitudes into account, it might be insightful to explore whether implementation intentions and imagery in this brief form are more effective when people have pro-environmental attitudes.

While the field experimental design in Experiments 4A and 4B helped collect more ecologically valid data based on objective behaviour measures, it was not possible to control for all extraneous variables that may have affected the participants, nor for other determinants of pro-environmental behaviour such as participant attitudes, intentions and other motivations. Future research should investigate how other variables interact with implementation intentions.

The research in Experiments 3, 4A and 4B focuses mainly on two types of recycling behaviour, which reflect a wide range of behavioural barriers related to convenience, effort and lack of opportunities to recycle. Other pro-environmental behaviours should be researched to better understand if implementation intentions have the same effect when the behaviours involve different types of obstacles such as increased financial costs.

Another limitation of this Experiments 4A and 4B is the focus on a conventional poster format used in a range of different university rooms, or in a gym. Future research should address other formats and marketing contexts, including social media or online marketing especially as the online environment is becoming an increasingly popular format for persuasive communication.

Finally, both Experiment 1 and 2 were completed by participants in an online, uncontrolled environment. Online research poses concerns regarding data quality from uncompensated, anonymous, unsupervised samples (Germine et al., 2012). Participants were asked to disclose the level of distraction in their surrounding environment, which had no effect on the overall task performance in either of the experiments, but the accuracy of this self-reported information

could not be verified. The attention and understanding checks included ensured adequate quality responses, and the feedback participants provided showed they were committed and engaged with the studies. To minimise noise due to the uncontrollable environment and variations in computer systems and speeds (Brown et al., 2014), a sample larger than those similar laboratory studies use was recruited, following Barnhoorn et al.'s (2014) recommendation. Experiment 1 involved between 81-92 participants for each condition, whereas previous lab experiments on implementation intentions or the Stroop task had 10-18 participants per condition (Brandstatter et al., 2001; Logan & Zbrodoff, 1998; Web & Sheeran, 2003). Similarly, previous research on prospective memory and implementation intentions employed 16-17 participants per condition (McDaniel, Howard, & Butler, 2008; McFarland & Glisky, 2012). In the current study, there were at least 46-82 participants per condition.

In relation to Experiment 1, RT tasks also pose specific challenges online: potential variation in computer speeds and distractions can affect accuracy when the measurement of precise millisecond timing is required (Crump et al., 2013). Nevertheless, this did not appear to be a problem here. This study has successfully replicated the Stroop effect, obtaining RT values similar to previous lab research (Logan & Zbrodoff, 1998; Lurquin, McFadden, & Harbke, 2014). Also consistent with other Stroop research (Crump et al., 2013; Logan & Zbrodoff, 1998; Lurquin et al., 2014; van Steenbergen et al., 2015), very high accuracy rates were obtained, indicating that the subjects understood the task and responded responsibly through its entirety. Not only are the RTs consistent with previous research, but another effect documented in the literature, that of age on RT (Van der Elst, Van Boxtel, Van Breukelen, & Jolles, 2006), has also been obtained, further supporting the validity of this method. This study thus provides further evidence towards the viability of conducting behavioural RT research online, alongside Crump et al. (2013) and Barnhoorn et al. (2014).

Table 61. Comparison between previous laboratory results and results from Study 1

	Overall RT	Congruent RT	Incongruent RT	Stroop Effect	Overall accuracy	Accuracy congruent trials	Accuracy incongruent trials
Logan & Zbrodoff (1998)	884ms	823ms	961ms	138ms	96%	97%	95%
Current study	911ms	834ms	994ms	160ms	96%	99%	92%

Similarly, in Experiment 2, while the PM task did not measure reaction times, it also required participants to be engaged and attentive to the task. Whilst some of the concerns with conducting research online include the possibility of technical measurement errors and the inability to monitor participants and thus a lack of information as to whether they are focused and attentive to the experiment (Gosling & Mason, 2015). This study, however, suggests that this was not an issue with Experiment 2. Furthermore, feedback participants provided showed they were engaged with the study, and enjoyed the task, as several participants also left comments indicating they enjoyed the trivia task. The study replicated previous results of PM experiments conducted in a lab, with very similar findings. Additionally, consistent with past studies (Schnitzspahn & Kliegel, 2009), age negatively affected PM performance ($r = -.11$, $p = .034$).

Table 62. PM performance in previous and the current study

Condition	McFarland and Glisky (2012)		Current study	
	M	SD	M	SD
Control	.31	.30	.40	.34
Implementation Intentions Manipulation (Conventional Implementation Intentions/Brief Implementation Intentions + Imagery)	.54	.23	.58	.30

This set of findings further suggests that not only did technical errors not affect the outcome of the experiment, but that participants also took both experiments seriously and were as engaged with the experiment as conventional participants completing the study in a laboratory.

Chapter 6: Conclusions

6.1 Summary of the main research findings

This thesis explored the relationship between self-control and pro-environmental behaviour, with the intent to provide practical insights that can help more effectively promote pro-environmental behaviour.

The first set of studies provided converging correlational and causal evidence to support the hypothesis that self-control influences pro-environmental behaviour. The findings suggest that lower self-control is detrimental to pro-environmental behaviour, whereas higher self-control is beneficial to pro-environmental behaviour. Furthermore, the studies helped identify a new, independent predictor of pro-environmental behaviour; it was shown that self-control and attitudes predict behaviour together. These findings are strengthened by the use of both correlational, and causal study designs, and by the consistent pattern of results found across different samples of participants, and different outcome measures.

The second set of studies provides evidence that implementation intentions can be applied in a brief format, without having to employ explicit instructions. This format involves using the implementations intentions sentence alongside relevant visual imagery, which provides a flexible alternative to the conventional use of implementation intentions. This set of studies also provides evidence that implementation intentions can effectively help individuals be more environmentally-friendly when used in a short, visual form in a marketing context. The studies provide practical, applied insights related to promoting pro-environmental behaviour, that could be used by policy makers and marketers. These findings also add further support to the first set of findings, on the relationship between self-control and pro-environmental behaviour. By showing that the use of a self-control strategy designed to enhance one's self-control for a specific behaviour (implementation intentions), can enhance pro-environmental behaviour, in comparison with a neutral control, and based on an objective measure of behaviour, the findings provide further empirical support to the implication that enhancing self-control has benefits for one's pro-environmental behaviour engagement. Furthermore, these findings are strengthened by the use of field experiments, which provide increased ecological validity.

An overview of the hypotheses in each set of studies in the thesis, and of the findings in each of the individual studies addressing the hypotheses, is provided in the following sections.

6.1.1 The role of self-control in pro-environmental behaviour

One of the aims of the thesis was to explore the relationship between pro-environmental behaviour and self-control. Although the pro-environmental behaviour literature has focused extensively on the role of motivation, such as attitudes or values, in pro-environmental behaviour, the literature has also highlighted a gap between people's motivations and their pro-environmental behaviour (Carrington et al., 2014). In light of this gap, it was suggested that self-control may help better understand the enactment of pro-environmental behaviour. Self-control is purported to help individuals overcome obstacles and temptations in the way of desired behaviours (Mann et al., 2013). Considering that pro-environmental behaviour entails numerous obstacles (Gleim et al., 2013), this thesis proposed that individual self-control might affect the extent to which individuals engage in pro-environmental behaviour.

Three hypotheses were developed, based on relevant literature. First, considering that self-control is believed to support desirable behaviours (such as pro-environmental behaviour), by enabling individuals to overcome undesirable behavioural tendencies (Tangney et al., 2004), it was hypothesised that self-control would positively influence behaviour.

Furthermore, two alternative hypotheses were proposed in relation to motivation to engage in behaviour. Others have argued that even though some behaviours may appear to be generally undesirable, individual motivations may vary across individuals (de Ridder et al., 2012). For instance, if someone does not have a goal to avoid binge drinking, then binge drinking would not pose a temptation. Therefore, self-control should be related to engagement in that behaviour, if the person does not possess a motivation to engage in that behaviour. Based on this, it was hypothesised that self-control should moderate the relationship between behaviour and motivation. However, others have argued that motivation and self-control are independent predictors of behaviour, and that they are both required in the enactment of behaviour (Gerrits et al., 2010; Sproesser et al., 2011; Tomasone et al., 2015). Therefore, it was also hypothesised that self-control and motivation are independent predictors of behaviour. The aim was to understand which of the hypotheses would be supported by the results.

To explore this assumption, a series of correlational and experimental studies were conducted in Chapter 3. Study 1 explored the relationship between self-control and a general, composite measure of pro-environmental behaviour. Study 1 found a positive correlation between them, supporting the first hypothesis. Furthermore, the study included a general measure of environmental attitudes (NEP), to test the two alternative hypotheses. The findings indicated that self-control predicts pro-environmental behaviour independently of environmental attitudes,

but does not moderate the relationship between attitudes and behaviour. This study also found an unexpected relationship between environmental attitudes and self-control.

Study 2 explored the relationship between self-control and a measure for a specific behaviour, recycling. Self-control was found to positively relate to recycling, extending the findings of Study 1. Furthermore, since specific attitudes to a behaviour are believed to be more closely related to that behaviour (Bamberg, 2003), a measure of specific attitudes to recycling was included. Similar to Study 1, it was found that self-control predicts recycling behaviour independently of environmental attitudes, but does not moderate the relationship between attitudes and behaviour.

Study 3 aimed to support the findings of Study 2 in a different sample, and to further explore the unexpected correlation between general environmental attitudes and self-control, found in Study 1. The findings replicated the findings from Study 2, with self-control being positively correlated to recycling, and predicting recycling independently of recycling attitudes. Furthermore, no relationship was found between general environmental attitudes and self-control, suggesting that the unexpected correlation in Study 1 was spurious. A meta-analysis with data from Studies 1, 2 and 3 confirmed the significant positive relationship between self-control and pro-environmental behaviour, and that self-control and attitudes were independent predictors of behaviour.

Study 4 aimed to provide causal evidence for role of self-control in pro-environmental behaviour, considering that the findings from Studies 1, 2 and 3 were correlational. To this end, the study aimed to manipulate situational self-control, based on priming high or low self-control (i.e., perceptions that one is good or bad at exercising self-control) (Ein-Gar, 2015; Nikolova et al., 2015). In this experiment, the findings indicated that high self-control led to significantly higher environmental outcomes than low self-control.

Study 5 aimed to extend the findings of Study 4, and to help better understand the effects of manipulating situational self-control in comparison to a neutral control condition. Although there were significant differences between high and low self-control in the environmental outcomes measured in this study, there were no differences between the high self-control and the control condition. One explanation was that the task used in the control condition may have inadvertently enhanced individual self-control. However, another possible explanation was that low self-control drove the effects obtained, and that the high self-control manipulation did not enhance self-control relative to the control. This study also addressed the alternative hypotheses related to attitudes, and via a measure of environmental attitudes (NEP). It was found that the

self-control condition (high vs. low self-control) and attitudes predicted likelihood to engage in pro-environmental behaviour independently, supporting the findings of Studies 1, 2 and 3.

Study 6 set out to clarify the effects of the high and low self-control manipulations relative to a control. A different task was selected for the control condition, less likely to enhance self-control perceptions. However, the results were similar to those of Study 5, where there was a significant difference between high and low self-control, but no difference between high self-control and the control condition in environmental outcomes. This suggests that the more likely explanation for these effects is that the manipulation successfully lowered self-control, but did not enhance self-control relative to an average level of self-control. Despite the lack of difference between the control condition, and the high self-control condition, the study indicates that, generally, higher levels of self-control lead to more pro-environmental tendencies, whereas lower scores led to decreased pro-environmental tendencies, thus helping to provide further causal evidence related to the beneficial role of self-control in pro-environmental behaviour. Study 6 also found that self-control and attitudes predicted pro-environmental tendencies independently, adding further support to the findings of Study 5. No moderating role of self-control in the relationship between environmental attitudes and pro-environmental tendencies was found. A meta-analysis combining the findings from Studies 4, 5 and 6 confirmed that higher levels of self-control were linked to higher pro-environmental tendencies, whereas lower self-control was linked to lower pro-environmental tendencies. The meta-analysis further supported H2b, by confirming that self-control and attitudes predict pro-environmental tendencies together.

The findings across this set of correlational and experimental studies thus highlight the role of self-control in pro-environmental behaviour, and provide converging evidence that self-control influences pro-environmental behaviour, and that it predicts behaviour together with motivation.

6.1.2 Promoting pro-environmental behaviour using implementation intentions

The thesis also aimed to explore the practical implications of the relationship between self-control and pro-environmental behaviour; based on the findings in Chapter 3 it was suggested that enhancing individual self-control could lead to improvements in pro-environmental behaviour. Furthermore, the potential of social-marketing approaches in supporting pro-environmental behaviour was highlighted. Following a review of strategies shown in the literature to enhance individual self-control, and their applicability in a marketing context, it was identified that implementation intentions is a strategy with the potential to be applied as a marketing tool that could influence pro-environmental behaviour on a wide scale.

Implementation intentions involve the creation of 'when-then' plans for enacting a desired behaviour (Gollwitzer, 1999).

Two hypotheses were developed, based on a review of relevant literature on implementation intentions. Implementation intentions are conventionally implemented via lengthy procedures, asking individuals to form their own 'when-then' plans, or asking individuals to repeat experimenter provided 'when-then' sentences (Armitage, 2009). However, this would not be suitable in a marketing context where people have limited attention for promotional messages (Hoffman & Daugherty, 2013). A new format suitable for marketing was proposed, based on a short implementation intentions sentence accompanied by visual imagery. Past research suggested narrative imagery can support implementation intentions in a persuasive context (Fennis et al., 2011); the research in this thesis explored the role of visual imagery, which is shown to be more effective than text at evoking imagery (Miniard et al., 1991), and in capturing people's attention (Pieters & Wedel, 2004). It was first hypothesised that implementation intentions can be induced successfully through brief image-based messages, usable in a marketing setting. Secondly, as implementation intentions are a strategy designed to enhance individuals' self-control, and have been shown to effectively enhance other behaviours which involve difficulties and obstacles (Gollwitzer & Sheeran, 2009; Haws, 2016), it was also hypothesised that implementation intentions supported by imagery are effective in promoting pro-environmental behaviour as used in marketing.

Chapter 5 included five experiments that explored these hypotheses. Addressing the first hypothesis regarding implementation intentions, Experiment 1 explored a video format using the implementation intentions sentence and imagery to influence performance in a Stroop task. The experiment compared three conditions: implementation intentions and imagery, implementation intentions only and a control with simple instructions for the task. The findings indicated no differences in Stroop task performance between the three conditions, suggesting a lack of effects of implementation intentions and imagery. Two explanations were suggested for the lack of effects: either this brief format of implementation intentions is not effective, either a ceiling effect was present in the Stroop task – as performance was already high, there may have not been enough room for implementation intentions to make a detectable difference.

Experiment 2 aimed to further test the first hypothesis related to implementation intentions, in the context of a prospective memory task, and to better understand the lack of effects obtained in Experiment 1. The format utilised in this experiment involved an image including a brief implementation intentions sentence and a picture depicting the relevant behaviour. As in Experiment 1, three conditions were explored: implementation intentions and imagery,

implementation intentions only and a control with simple instructions for the task. Furthermore, two versions of the prospective memory task were utilised: a standard version, with the simple prospective memory task, and a difficult version, where a cognitive business element was introduced in the task, in order to prevent performance in this version from being too high to obtain an effect of implementation intentions. The cognitive business dimensions would also help understand whether implementation intentions did not occur in the previous study due to a ceiling effect. The findings indicated that implementation intentions and imagery enhanced performance in the prospective memory task relative to a control, and to implementation intentions sentence only. However, this occurred only in the difficult version of the task, and not in the easy version. This suggests that the lack of effects in Experiment 1 was due to a ceiling effect in the Stroop task, and that implementation intentions in a brief format supported by imagery can enhance behaviour. The findings also suggest that implementation intentions could be most useful in behavioural areas that have low rates of adoption, given that in this experiment, they led to larger improvements in a task in which performance was low.

Experiment 3 addressed the second hypothesis related to implementation intentions, and explored the brief implementation intentions format in the context of plastic bottle recycling, in a field experiment. Due to the lack of difference between the implementation intentions sentence, and the control condition in Experiment 2, only implementation intentions and imagery were compared to a control condition. The experiment involved a pretest-postest design, implemented during a university course. Students first reported their current recycling behaviour, then were exposed to the manipulation via a poster displayed in classrooms, followed by a final report of their recycling behaviour following the manipulation. The study found that the implementation intentions accompanied by imagery led to changes in recycling behaviour, but only for those participants that had noticed the manipulation. If participants had not seen the manipulation, no increase was observed. However, the results of this study were not statistically significant. One explanation for this may be that the small sample size, due to low attendance in the classes (only a small number of students attended all the stages of the data collection), led to reduced statistical power. This study was also limited by reliance on self-reported behaviour.

Experiment 4A extended the findings of Experiment 3 in a design including an objective measure of behaviour. The study explored the effects of a poster using brief implementation intentions and imagery, on plastic cup recycling, in a professional development unit of a university. In this room, individuals had more opportunities to throw plastic cups in the general waste bin than to recycle them, as reduced opportunities to recycle are an obstacle shown to

affect recycling (Wagner, 2013). Plastic cup recycling was measured before and during the use of the poster. The findings indicated a significant increase in plastic cup recycling during the experimental manipulation.

Experiment 4B extended the findings of Experiment 4A in a different context. The study measured plastic cup recycling and took place in a gym. In this experiment, the recycling bin was farther away from the plastic cup dispenser, whereas the general bin was very close, mimicking one of the obstacles found to affect recycling: distance to recycling facilities (Garcés et al., 2002; Salonen & Åhlberg, 2013). Although the effects were not significant, the findings in Experiment 4B also indicate that the poster enhanced recycling behaviour. A meta-analysis combining the data from Experiments 4A and 4B, to increase statistical power, confirmed the effects of the implementation intentions and imagery on plastic cup recycling behaviour.

The findings across this set of online and field experimental studies provide evidence regarding a novel, brief format of implementation intentions, suitable for marketing application, and provide evidence that implementation intentions can be used in this format, in an applied context, to influence pro-environmental behaviour.

6.2 Contributions

Reflective of the fact that pro-environmental behaviour research is a complex and interdisciplinary field (Klöckner, 2013), this thesis draws on and contributes to three main areas of the literature: the pro-environmental behaviour literature, the self-control literature, and the marketing literature. The contributions in each of these areas are outlined in the sections below.

6.2.1 Contribution to the pro-environmental behaviour literature

First, the thesis contributes to the pro-environmental behaviour literature, by helping to better understand psychological drivers of pro-environmental behaviour. The research provides novel findings on the relationship between self-control and pro-environmental behaviour, which has been largely overlooked in the literature. Although the role of self-control in pro-environmental behaviour has been theoretically discussed (Nielsen, 2017), the empirical evidence is limited. The current findings thus provide empirical support to previous theoretical suggestions that self-control may be required for one to engage in pro-environmental behaviour. Furthermore, one particular strength of the evidence provided in this thesis to support this hypothesis is the empirical approach including both correlational and experimental study designs. The thesis provides both correlational evidence regarding the existence of a statistical association between self-control and pro-environmental behaviour, as well as causal evidence that self-control influences pro-environmental behaviour. Furthermore, the findings were consistent across

different samples of participants, and different outcome measures.

The research also provides insights into how self-control and motivation influence pro-environmental behaviour. In the beginning of the thesis, a review of the literature highlighted a focus on motivational factors that influence pro-environmental behaviour, as well as a pro-environmental motivation-behaviour gap (Carrington et al., 2010; 2014). By approaching pro-environmental behaviour from a self-control perspective, this thesis addresses one of the processes by which individuals may overcome obstacles that prevent them from engaging in pro-environmental behaviour, thus helping to better understand the gap between people's motivations and their behaviours. In this thesis, self-control and motivation, operationalised as attitudes, were shown to predict pro-environmental behaviour independently. The findings thus reveal a new, independent predictor of pro-environmental behaviour, indicating that both motivation and self-control contribute to engaging in pro-environmental behaviour and highlighting the environmental benefits of having high levels of motivation, together with high levels of self-control. This contribution is also strengthened by the use of both correlational and causal evidence in exploring the role of motivation and self-control as independent predictors of pro-environmental behaviour.

The finding that higher levels of self-control are linked to higher engagement in pro-environmental behaviour, and lower levels of self-control are linked to lower engagement in pro-environmental behaviour also suggests that marketers and policy makers may draw on insights from the self-control literature to support individual self-control, and avoid the negative environmental consequences of lower levels of self-control. The self-control literature has addressed strategies and interventions to enhance self-control for other behaviours, which may also be applied in the case of pro-environmental behaviour. This implication is supported by the findings in the second part of the thesis; the second set of findings, in Chapter 5, indicates that the use of a particular strategy to enhance individual self-control (implementation intentions) can enhance pro-environmental behaviour, in a short format applicable in marketing. Therefore, another contribution of the thesis is highlighting the role of self-control strategies in influencing pro-environmental behaviour, and broadening research perspectives on potential interventions and approaches to enhance pro-environmental behaviour.

Importantly, the studies in the second part of this thesis also contribute to the literature by providing evidence on a practical intervention that can enhance pro-environmental behaviour: the use of an implementation intentions sentence tailored to a specific behaviour, along with relevant visual imagery of the behaviour. The intervention in this thesis was studied using field experiments, which provide more ecologically valid findings than laboratory experiments

(Keizer, Lindenberg, & Steg, 2014), and demonstrate that this approach is effective in a real-world setting, where individuals need to routinely balance day-to-day life with the desire to be environmentally-friendly (Axon, 2017). Implementation intentions in a brief format had positive effects on the participants' behaviour, considering that they were at the same time engaging in other activities, such as working out or learning. The validity of the findings in these studies is further supported by fact that the two field experiments on plastic cup recycling included obstacles typical to recycling behaviour: distance to facilities (Garcés et al., 2002), and lower opportunities to recycle (Wagner, 2013).

6.2.2 Contribution to the self-control literature

Secondly, the findings contribute to the self-control literature. Extensive research has demonstrated that self-control supports desirable behaviours such as healthy eating, academic performance, dieting, and others, whereas a lack of self-control is linked to undesirable behaviours such as smoking or alcohol addiction, gambling, overeating and others (de Ridder et al., 2012). The findings in this thesis extend these findings by identifying the positive influence of self-control on another type of desirable behaviour: pro-environmental behaviour. Thus, the research provides additional evidence that supports the positive effects of self-control on a wide range of outcomes. Furthermore, the findings add to a subset of the self-control literature relating to the influence of self-control on cooperation, a prosocial behaviour that benefits others, rather than the individual (Martinsson et al., 2012). The findings in this thesis contribute to this area of the literature, and extend the findings on the positive influence of self-control on pro-environmental behaviour, another behaviour that benefits others. The findings in this thesis also contribute to a more limited area of the self-control literature, that has suggested that both motivation and self-control are required in enacting a behaviour, and has found that self-control is an independent predictor of behaviour, together with motivation, for behaviours such as healthy eating or dieting (Gerrits et al., 2010; Sproesser et al., 2011; Tomasone et al., 2015). The research in this thesis extends these findings to a new behavioural area: pro-environmental behaviour, and lends further empirical support to the idea that both motivation and self-control are required in enacting a behaviour.

The thesis also contributes to the limited literature on self-control strategies, and their role in influencing pro-environmental behaviour. In particular, the thesis contributes to the literature documenting the role of implementation intentions as a self-control strategy that can enhance pro-environmental behaviour. This literature is limited to a few studies (Bamberg, 2002; Bell et al., 2016) that explore the effects of conventional implementation intentions. The findings in this thesis further strengthen the evidence on the role of implementation intentions in pro-

environmental behaviour. Furthermore, the findings highlight the versatility of implementation intentions in enhancing different types of pro-environmental behaviour; the current findings focus on recycling, whereas past studies have also explored areas such as energy saving (Bell et al., 2016) or organic food purchasing (Bamberg, 2002).

The thesis also contributes to literature documenting the marketing application of implementation intentions, currently under-researched, with only one study addressing the role of persuasive implementation intentions (Fennis et al., 2011) in a different format than the one that this thesis explores. The thesis provides evidence on the use of a novel format of implementation intentions, based on a brief implementation intention and vivid visual imagery, which has not to date been researched. Conventionally, implementation intentions interventions require participants to form or repeat 'when-then' sentences relating to a specific behaviour. The format researched in this thesis indicates that a format using the implementation intentions sentence and visual imagery has similar effects to conventional implementation intentions on behaviour. The thesis thus broadens the possibilities for using implementation intentions to reach populations on a wide scale and promote pro-environmental behaviour, as well as other behaviours that have been shown to benefit from implementation intentions.

The thesis also provides evidence regarding the role of imagery in implementation intentions. Mental imagery has been shown to support the effects of conventional implementation intentions (Knauper et al., 2009), and narrative imagery has been shown to support persuasive implementation intentions using provided using textual information (Fennis et al., 2011). The thesis demonstrates that visual imagery, provided through pictures, can effectively support the mental processes involved in implementation intentions, and lead to positive effects on behaviour.

6.2.3 Contribution to the marketing literature

Finally, the thesis also contributes to the marketing literature by providing evidence on a social marketing tool that can be used to enhance pro-environmental behaviour. The potential of social marketing to support pro-environmental behaviour has been highlighted, although the literature on the effectiveness of social marketing in enhancing pro-environmental behaviour is limited (Truong, 2014). The role of nudges in promoting engagement in pro-environmental behaviour has also been suggested, with a growing literature that aims to identify practical nudges for pro-environmental behaviour (Schubert, 2017). The findings in this thesis highlight a novel type of nudge (implementation intentions) that can promote pro-environmental behaviour, and that can be applied on a wider scale as a marketing tool, in the form of a promotional poster with implementation intentions and imagery.

This research also contributes to the social marketing literature by highlighting the potential use of brief implementation intentions and imagery as a strategy to influence not only pro-environmental behaviour, but other beneficial behaviours that can be promoted using social marketing. Social marketing has been utilised in areas such as healthy eating or improving exercise (Gordon et al., 2006). These behaviours are also behaviours that implementation intentions have been shown to help enhance in their conventional application (Adriaanse et al., 2011; Andersson & Moss, 2011). This suggests that brief implementation intentions and imagery may be a useful social marketing tool to enhance these behaviours too.

6.3 Practical Implications

The research in this thesis has practical implications regarding the promotion of pro-environmental behaviour, with practical relevance to policy makers, researchers and marketers. First, as outlined in Chapter 4, one practical implication of the findings in this thesis is that policy makers may draw on insights from the self-control literature to support individual self-control, and avoid the negative environmental consequences of lower levels of self-control. Chapter 4 provides a detailed overview of the main self-control strategies that have been tested in interventions to enhance behaviours that require self-control. Although it was argued that these may not be suitable for marketing application (which was the focus of the second part of this thesis), they may still be helpful to policy-makers, in understanding how to enhance pro-environmental behaviour, and for the creation of programmes that are not based on social marketing. For example, one of the strategies reviewed in the thesis was that of programmes designed to enhance trait self-control in childhood. Programmes involving cognitive coping tasks designed to develop children's self-control skills (Piquero et al., 2010), or the integration of activities such as martial arts, yoga, aerobic, or mindfulness activities in school curricula (Diamond & Lee, 2011) may lead to the improvements in children's overall self-control, with potential effects on a series of positive societal outcomes, including, but not limited to pro-environmental behaviour.

Chapter 5 provides clear practical insights for policy makers and social marketers into an effective strategy to promote pro-environmental behaviour. The use of a format including the implementation intentions sentence, along with relevant visual imagery, was shown to effectively enhance behaviour, measured objectively rather than inferred from intentions or self-reports. This format may thus be employed as such by policy makers and may be adapted to promote other pro-environmental behaviours on a wide scale. For example, posters using an implementation intentions sentence such as "When you leave the room, turn the lights off" along with visual imagery related to the turning the lights off, could be implemented to promote

energy saving. Furthermore, although the current research explored the use of brief implementation intentions and imagery for promotional posters, this format could also be used in other types of promotional materials, such as flyers, billboard or outdoor displays.

Finally, this format of implementation intentions may be used in social marketing for other behaviours than pro-environmental behaviour. Given that brief implementation intentions and imagery helped enhance another behaviour researched conventionally in the implementation intentions literature (PM performance), they may also support other behaviours that conventional implementation intentions have been shown to support, such as fruit and vegetable consumption (Harris et al., 2014). For example, a poster to promote fruit consumption could include the sentence "When you have lunch, eat a piece of fruit after your food," with an image of someone eating fruit.

6.4 Limitations and future research

The research in this thesis also has limitations. The limitations of the studies in the thesis were previously discussed in their corresponding chapters (Chapters 3 and 5). This section reviews the main limitations of the research conducted in this thesis and highlights future research that could be conducted in light of these limitations.

Several of the studies in this thesis relied on self-reported pro-environmental behaviour (Studies 1, 2, 3, 4, 5, 6 in Chapter 3, and Experiment 3 in Chapter 5). Self-reports may be affected by social desirability bias, or a tendency of individuals to present themselves in a favourable light and over-report behaviours perceived to be socially desirable, instead of reporting their actual feelings or behaviours (Randall & Fernandes, 1991). This may also be relevant for pro-environmental behaviour and attitudes, both of which could be considered to be socially desirable (Ewert & Galloway, 2009). Nevertheless, social desirability bias has been found to have a very limited impact on self-report measures of both pro-environmental behaviour and attitudes (Milfont, 2009). Furthermore, the relationships between self-report measures of self-control and a wide range of behaviours are also shown to be robust when controlling for social desirability bias, suggesting that the relationships between self-control and behaviour do not simply reflect socially desirable response bias (Tangney et al., 2004). Although these results suggest that socially desirability bias may not have been an issue in the studies in this thesis, self-reported measures may not be as accurate as objective behaviour measures. Self-reported measures of behaviour require individuals to approximate the frequency of engaging in past behaviour, which may lead to inaccurate responses (Schwarz, 1999). Although objective measures of pro-environmental behaviour would provide more accurate results (Kormos &

Gifford, 2014), the results involving self-reported measures of behaviour in the thesis were replicated across several studies and were consistent over a sample of 1201 participants (Studies 1, 2 and 3 in Chapter 3, that provided correlational evidence), and 450 participants (Studies 4, 5 and 6 in Chapter 3), suggesting that the findings are valid and reliable. Similarly, the results of Experiment 3 in Chapter 5, that relied on self-reported measures of behaviour, were also supported by two field experiments that measured behaviour objectively.

Another limitation of the studies in this thesis was that, due to the online design of several of the studies, there was a lack of control over the participants' environment and over any distractions that they may have encountered, which may raise questions related to the accuracy of the results (Gosling & Mason, 2015). Studies 1, 2, 3, 4, 5 and 6 in Chapter 3, and Experiments 1 and 2 in Chapter 5 were all conducted online. Measures, such as attention checks, were implemented to ensure that the participants were paying attention to the study. However, it may still have been possible for the participants to have been engaged in other activities at the time, such as conversations with others, or to have experienced interruptions during the studies, as it was not possible to entirely control these aspects. Nevertheless, the online studies yielded similar results consistent with past research, as outlined in Tables 46, 47 and 48, and in Tables 61 and 62. These results suggest that on the whole, the results obtained from online sample were reliable, and were largely not affected by extraneous variables in the environment of the participants.

Although the online recruitment enabled access to a more diverse sample than samples used in traditional social science research, composed of undergraduate students (Henrich et al., 2010), the samples for the studies in this thesis were predominantly western, similar to a large proportion of the research on pro-environmental behaviour (Tam & Chan, 2017). However, findings indicate that there are differences between countries and cultures in the variables that affect pro-environmental behaviour (Milfont & Markowitz, 2016). For example, Tam and Chan (2017) find, in their analysis of data from 32 countries, that in societies with higher levels of distrust and present orientation (where individuals focus on the present rather than the future), the association between environmental concern and behaviour was weaker, whereas in more individualistic countries it was higher. Furthermore, Savani and Job (2017) suggest that different cultures may have different beliefs about self-control, and argue that people's cultural background and beliefs contribute to individuals' situational self-control. Considering that there may be cross-cultural differences in the way in which attitudes and self-control influence behaviour, future research should include more varied samples, including more individuals from other cultures than western cultures.

Another limitation relates to the manipulation used in Studies 4, 5 and 6 to influence situational self-control, which relied on priming low or high self-control. In Chapter 3, it was suggested that participants may have had their own lay theories, or beliefs that self-control is required for pro-environmental behaviour, which may have in turn led to answers consistent with these lay theories. Further research should explore whether participants indeed have lay theories related to the role of self-control in pro-environmental behaviour, and assess to what extent they affect the effects of manipulation self-control on pro-environmental behaviour. Furthermore, although the manipulation in Studies 5 and 6 led to significant differences between the high and low self-control conditions in pro-environmental outcomes, it did not significantly increase or decrease these outcomes compared to a control. Considering that the majority of research on situational self-control only addresses two levels: high and low (Ein-Gar, 2015; Ein-Gar & Steinhart, 2017; Nikolova et al., 2015), future research should address other manipulations of high and low self-control relative to a baseline.

In exploring the relationship between self-control and pro-environmental behaviour, this thesis explored a single type of motivation for pro-environmental behaviour: attitudes. Attitudes are regarded as one of the most important predictors of pro-environmental behaviour, although other research raises issues with regards to their ability to predict pro-environmental behaviour (Bamberg & Möser, 2007). Other commonly researched motivations, such as moral norms (Stern, 2000) should be explored in conjunction to self-control.

Furthermore, in Chapter 5 it was shown that implementation intentions can enhance pro-environmental behaviour. However, the studies in Chapter 5 explored did not research how implementation intentions operate in conjunction with relevant motivations for a behaviour. Considering that in in Chapter 3 it was found that self-control and attitudes are independent predictors of pro-environmental behaviour, it would be insightful to explore whether implementation intentions similarly affect behaviour together with environmental attitudes, or whether they moderate the relationship between attitudes and behaviour. Besides attitudes, the other motivational factors shown to predict pro-environmental behaviour should also be researched, to better understand the effects of implementation intentions together with these motivations.

Although the field experiment findings in Experiments 3, 4A and 4B from Chapter 5 strongly suggest that a brief form of implementation intentions, combined with imagery, enhanced pro-environmental behaviour, an alternative explanation could be that the vivid imagery element of the poster (e.g., image of a hand throwing a cup in the bin) alone, rather than in combination with the implementation intention sentence, affected behaviour. Past studies found that simply

providing vivid narrative imagery, without implementation intentions, does not enhance behaviour compared to a control message, or to a message with implementation intentions alongside vivid imagery (Fennis et al., 2011), suggesting that this explanation is unlikely. However, the field studies did not address this possibility, due to methodological limitations. Future research should include an additional condition including imagery only, besides the implementation intentions and imagery condition, and the control condition, to rule out this explanation. Another possible explanation for the results may be that the poster simply reminded participants to recycle, instead of acting as a strategy to enhance self-control. Due to the design of the field experiments, it was not possible to assess the extent to which the processes characteristic to implementation intentions occurred when seeing the poster. Future research could assess the extent to which these processes occur in a brief form of implementation intentions and imagery encouraging pro-environmental behaviour. Follow-up qualitative research could also provide further insights regarding the self-control mechanisms by which a poster using brief implementation intentions and imagery may influence pro-environmental behaviour.

The research in Studies 2 and 3 in Chapter 3, and in Experiments 3, 4A and 4B, in Chapter 5 focuses on recycling, a type of waste-related behaviour, which has several strengths. Recycling is a highly relevant behaviour for climate change mitigation, given its numerous environmental benefits (Allwood et al., 2011; Swim et al., 2011). Recycling also involves numerous barriers such as convenience, effort and lack of opportunities to recycle (Tonglet, Phillips, & Bates, 2004). Research indicates that recycling is mainly motivated by environmental concerns, including a desire to protect the environment (Meneses & Palacio, 2005) or conserving resources (Ebreo & Vining, 2001; Vining, Linn, & Burdge, 1992). By focusing on recycling, the studies in this thesis helped better understand how self-control and strategies to enhance self-control influence a behaviour that is largely based on ecological motives, with few individual benefits to be gained from engaging in it. However, the focus on a single behaviour (recycling) also has limitations. Different pro-environmental behaviours have different features and obstacles. For example, a barrier to green consumption is related to higher financial costs (Gleim et al., 2013), which may be affected differently by self-control. Furthermore, while recycling is largely motivated by environmental reasons (Vining et al., 1992), other behaviours may reflect different types of motivations, and might thus be influenced differently by self-control. For example, reducing one's energy consumption is also motivated by self-interested reasons, such as saving money (Ohler & Billger, 2014). Furthermore, de Ridder et al. (2012) found that self-control had larger or smaller effects on different types of behaviour, suggesting that it would be insightful to understand how self-control affects other pro-environmental

behaviours. Future research should explore the effects of trait self-control, the self-control manipulation in Chapter 3, and the implementation intentions format in Chapter 5 on other, specific pro-environmental behaviours, to understand if their effects are stronger or weaker on other, specific types of pro-environmental behaviour. For example, future research could explore behaviours such as green consumption, saving water, saving energy, or re-using products instead of throwing them away.

6.5 Future directions

Besides future research that addresses the limitations of the studies in this thesis, the findings also suggest further avenues for research that might yield useful insights regarding pro-environmental behaviour.

An area with potential for future exploration pertains to the processes by which self-control influences pro-environmental behaviour. It has been suggested that, besides enabling individuals to overcome obstacles to their desired behaviour (Fishbach & Trope, 2005), self-control is also linked to the breaking of bad habits, and the creation of beneficial habits that operate unconsciously to influence behaviour (de Ridder et al., 2012). Habits have been found to mediate the relationship between self-control and behaviour (Adriaanse et al., 2014; Galla & Duckworth, 2015). Unsustainable habits are also seen as a major barrier to pro-environmental behaviour (Bamberg, 2002; Gifford, 2011), and research indicates that habits may influence different types of pro-environmental behaviour (Bamberg & Schmidt, 2003; Knussen & Yule, 2008; Knussen et al., 2004). Exploring the links between habits, self-control and pro-environmental behaviour, and whether habits mediate the relationship between self-control and pro-environmental behaviour could yield a better understanding of the role of habits in pro-environmental behaviour, and additional insights into the mechanisms by which self-control operates to influence desirable behaviour.

One of the unexpected findings in the thesis related to distance to the recycling bin, during the implementation intentions manipulation in Experiment 4B. When a small reduction in the distance to the recycling bin occurred, there was no significant difference in recycling, compared to the initial distance to the recycling bin. When this distance was substantially reduced, and the distance to the general waste bin was increased, recycling increased considerably. This suggests that it would be insightful to further explore the interplay between contextual and individual factors (i.e., self-control), and the effectiveness of interventions based on self-control strategies, in the presence of different levels of contextual constraints for pro-environmental behaviour. The role of contextual factors, or barriers, such as the availability of

public transport (Steg & Vlek, 2009), or distance to recycling facilities (Garcés et al., 2002) has been highlighted in past literature. Steg and Vlek (2009) propose that contextual factors might affect behaviour directly (e.g., free bus tickets might enhance public transport use), or might moderate the relationship between motivational factors and behaviour (e.g., environmental concern would result in more pro-environmental action if contextual barriers are removed, but not when behaviours incur numerous obstacles). Given that both self-control and motivation are shown, in this thesis, to be involved in pro-environmental behaviour, it would also be insightful to explore whether contextual factors (e.g., distance to recycling facilities) moderate the relationship between self-control and pro-environmental behaviour (e.g., high self-control would be more strongly related to pro-environmental behaviour in the presence of contextual obstacles that create a self-control conflict, than in the absence of obstacles) or whether they are a direct predictor of behaviour, together with self-control and motivational factors. Similarly, future research could address whether the effectiveness of interventions to promote pro-environmental behaviour based on self-control strategies is affected by contextual factors.

The studies in this thesis focus on individual traits and states, and on their influence on pro-environmental behaviour. However, one's behaviour is also influenced by one's social context and group membership (Terry, Hogg, & White, 1999). The Social Identity Approach (Reicher, Spears & Haslam, 2010; Tajfel & Turner, 1979) highlights the role of social identity, or the way in which one defines oneself as a member of a social group, in explaining human behaviour. According to the social identity approach, individuals have multiple personal (based on individual characteristics) and social identities (based on the groups in which one belongs), which can become salient in different social contexts (Fielding & Hornsey, 2016; Tajfel & Turner, 1979; Terry et al., 1999). When an individual self-categorises into a certain group (i.e., in terms of a specific social identity), similarities with members of the same group, or in-group, and differences to the members another group, or out-group, are accentuated; the individual will seek to behave in accordance with the in-group stereotype (Reicher et al., 2010). Thus, one may behave differently in different contexts, depending on the identities that are salient in those contexts and the norms and behaviours associated with them (Reicher et al., 2010; Terry et al., 1999). For example, one may behave differently as an academic in the workplace, than as a sports fan during sporting events (Reicher et al., 2010). The role of different social identities has also been highlighted in the environmental context, where research has shown that identification with environmentalist groups was positively related to pro-environmental behaviour (Dono, Webb, & Richardson, 2010). Furthermore, different social contexts were shown to activate different social identities, which influenced pro-environmental behaviour. Rabinovich, Morton, Postmes and Verplanken (2012) modified the salience of different social identities via

comparison to other groups. When British participants compared the British to Americans, they judged the British to be more environmentally-friendly and subsequently collected more environmental leaflets than when they compared the British to the Swedish. Thus, future research could explore how different social identities influence pro-environmental behaviour in conjunction with self-control or strategies to enhance self-control. As higher self-control has been shown to be associated with higher adherence to social norms (DeBono, Shmueli, & Muraven, 2010), an intervention supporting one's self-control, combined with activating an environmentally-relevant social identity could have beneficial effects on pro-environmental behaviour. Researching what kinds of social identities are associated with pro-environmental behaviour, and how they interact with self-control, could help better understand and design interventions to enhance pro-environmental behaviour.

Finally, considering that the research in this thesis demonstrates the link between self-control and pro-environmental behaviour, and the ability of one self-control strategy to enhance pro-environmental behaviour, in a marketing context, it opens further avenues for investigation into how other self-control strategies can influence pro-environmental behaviour, in both marketing and laboratory-based interventions. One of the strategies reviewed in Chapter 4, choice bracketing, could present opportunities to enhance pro-environmental behaviour. Choice bracketing involves the framing of choices as a single decision versus a decision connected to future decisions (Myrseth & Fishbach, 2009). Much remains unknown about choice bracketing, with conflicting findings regarding the type of framing that would most effectively promote desirable behaviour (Fishbach & Zhang, 2008; Read et al., 1999). However, considering the promising results regarding the brief format of implementation intentions in this study, choice bracketing might also represent a promising avenue for research. Future research could explore what type of framing could influence pro-environmental behaviour, and how this could be further applied in a marketing context.

6.6 The current findings in the broader context of climate change mitigation

This thesis addresses ways in which the pro-environmental behaviour of individuals can be enhanced. The findings provide insights on how to improve pro-environmental behaviour, on the assumption that these behaviours are available to individuals, but involve more difficulty, inconvenience, time or effort. For instance, the studies in Chapter 5 demonstrated an increase in recycling, when such facilities were available, but under-utilised. However, it is important to note that, although the focus on individual behaviour change is an important element of climate

change mitigation (IPCC, 2014b), behaviour change alone is not enough in achieving positive environmental outcomes.

As previously highlighted, contextual factors may play a significant role in whether one engages in pro-environmental behaviour or not (Steg & Vlek, 2009). For example, one cannot take the train or the bus, if no such service is available, and would be constrained to continue using a car (Steg & Vlek, 2009). Similarly, one would not be able to recycle, if not facilities were available. Therefore, regardless of one's motivations and self-control, in some cases, people may simply not be able to engage in pro-environmental behaviour. Achieving behaviour change involves not only addressing the psychological aspects involved in pro-environmental behaviour, such as self-control and motivation, which can play an important role when individuals have access to environmentally-friendly alternatives that entail more effort than unsustainable alternatives, but also the removal of major structural barriers (such as the unavailability of sustainable alternatives) through changes in infrastructure or legislation (Gifford, 2011; Steg & Vlek, 2009; Stern, 2011).

Furthermore, climate change mitigation is argued to depend on a set of different strategies, that all need to be employed in conjunction to alleviate environmental problems (IPCC, 2014b). The IPCC (2014b) highlights the importance of not only individual behaviour change, but also that of other mitigation strategies, such as achieving efficiency enhancements that could reduce the emissions generated through energy supply and industrial production processes. The role of international co-operation in developing climate change policies, research and development of sustainable technologies has also been highlighted as crucial in climate change mitigation (IPCC, 2018).

Approaches based on behaviour change towards more sustainable alternatives are also embedded in an economic system which supports materialistic and consumerist tendencies, which, in turn, promote unsustainable behaviour (Jackson, 2009). On one hand, policy-makers, governments and other organisations increasingly promote the importance of being environmentally-friendly (Burchell et al., 2013); the majority of individuals are now thus expressing concern for the environment (European Commission, 2017). On the other hand, the majority of marketing messages, which are becoming increasingly pervasive in everyday life, promote consumption, which is detrimental to the environment, and reinforce the importance of material possessions (Alexander, Cromption, & Shrubsole, 2011). Jackson (2009) argues that, although governments need to support long-term environmental sustainability, they also believe that they need to ensure economic stability through economic growth. As economic growth is based on the consumption of goods, governments have an incentive to support an economy

based on consumption, and thus to not restrict marketing activities encouraging a lifestyle based on material consumption (Jackson, 2009). Wilkinson and Pickett (2018) further argue that consumerist and materialistic tendencies are also intensified by social inequality; in societies with greater inequality, due to large differences in wealth, individuals focus more on consuming and utilising goods as symbols of success and status. Consequently, the authors argue that more equal societies would bring environmental benefits related to reduced conspicuous and wasteful consumption, based on a need to maintain social status (Wilkinson & Pickett, 2018). This highlights a contradiction that individuals face regarding pro-environmental behaviour: even if they may want to be environmentally-friendly, at the same time they are encouraged to consume more. Gatersleben, White, Abrahamse, Jackson and Uzzell (2010) argue that sustainable lifestyles cannot be achieved if individuals are trying to be sustainable and thus adopt some sustainable behaviours, while at the same time engage in other unsustainable behaviours (Gatersleben et al., 2010). For instance, one may recycle, and at the same time, engage in unsustainable behaviour such as frequently purchasing large amounts of clothes, out of a need to display social status. This suggests that, along with interventions for behaviour change, broader economic and social changes, such as reductions in social inequality and the development of alternative economic models, less focused on consumerism, are needed to ensure long-term sustainability (Jackson, 2009; Wilkinson & Pickett, 2018).

As highlighted in this section, although pro-environmental behaviour plays an important role in climate change mitigation, the changes needed to reduce climate change extend beyond simply promoting more sustainable behaviour through interventions. The adoption of pro-environmental behaviour needs to be accompanied by broader changes at all the levels highlighted above. This thesis therefore contributes to a piece of a larger, complex puzzle that is climate change mitigation.

6.7 Final conclusion

This thesis provided a better understanding of pro-environmental behaviour, as well as practical insights on how to promote pro-environmental behaviour. The thesis proposed that motivation alone may not be sufficient for one to engage in pro-environmental behaviour, given the numerous obstacles one may encounter in their attempts to be environmentally-friendly. The thesis argued that self-control may help individuals overcome these obstacles and may thus support one's pro-environmental behaviour. The empirical findings supported this assumption, and indicated that self-control influences pro-environmental behaviour, supported by causal and correlational evidence. Higher self-control was associated with higher engagement in pro-environmental behaviour, whereas lower self-control was associated with lower levels of pro-

environmental behaviour. Furthermore, it was found that self-control predicted behaviour together with motivation, highlighting the environmental benefits of having high levels of self-control and of pro-environmental motivation. These studies contribute to a better understanding of pro-environmental behaviour, by revealing a new predictor of pro-environmental behaviour and highlighting that both motivation and self-control are required to enact pro-environmental behaviour.

The second part of the thesis addressed the role of a strategy to enhance an individual's self-control, implementation intentions, applied in a marketing context, that could in turn, enhance one's pro-environmental behaviour. Evidence from online and field experiments indicated that implementation intentions can be used in a brief marketing format, and that they can promote pro-environmental behaviour effectively. The findings contribute by providing practical and applicable insights about promoting pro-environmental behaviour, suggesting a new strategy that can be implemented as an effective marketing tool to change behaviour.

On a broader level, the IPCC (2018) has highlighted the importance of taking urgent action to mitigate climate change. This research has identified mechanisms by which one important aspect of climate change mitigation – pro-environmental behaviour, is enacted, and ways in which it can be enhanced, drawing on these mechanisms. This thesis thus advances the important role of self-control in promoting environmental sustainability.

References

Aarts, H., & Dijksterhuis, A. (2000). The automatic activation of goal-directed behaviour: The case of travel habit. *Journal of Environmental Psychology*, *20*(1), 75–82. https://doi.org/10.1006/jevp.1999.0156

Aarts, H., Dijksterhuis, A. P., & Midden, C. (1999). To plan or not to plan? Goal achievement or interrupting the performance of mundane behaviors. *European Journal of Social Psychology*, *29*(8), 971–979.

Aarts, H., Verplanken, B., & Knippenberg, A. (1998). Predicting Behavior From Actions in the Past: Repeated Decision Making or a Matter of Habit? *Journal of Applied Social Psychology*, *28*(15), 1355–1374. https://doi.org/10.1111/j.1559-1816.1998.tb01681.x

Abbey, J. D., & Meloy, M. G. (2017). Attention by design: Using attention checks to detect inattentive respondents and improve data quality. *Journal of Operations Management*, *53–56*, 63–70. https://doi.org/10.1016/j.jom.2017.06.001

Abeler, J., & Nosenzo, D. (2015). Self-selection into laboratory experiments: pro-social motives versus monetary incentives. *Experimental Economics, Springer;Economic Science Association*, *18*(2), 195–214.

Abrahamse, W., & Steg, L. (2009). How do socio-demographic and psychological factors relate to households' direct and indirect energy use and savings? *Journal of Economic Psychology*, *30*(5), 711–720. https://doi.org/10.1016/j.joep.2009.05.006

Abrahamse, W., Steg, L., Vlek, C., & Rothengatter, T. (2005). A review of intervention studies aimed at household energy conservation. *Journal of Environmental Psychology*, *25*(3), 273–291. https://doi.org/10.1016/j.jenvp.2005.08.002

Achtziger, A., & Gollwitzer, P. (2010). Motivation and volition in the course of action. In J. Heckhausen & H. Heckhausen (Eds.), *Motivation and Action* (2nd ed., pp. 272–295). New York: Cambridge University Press. https://doi.org/10.1017/CBO9780511499821.012

Achtziger, A., Hubert, M., Kenning, P., Raab, G., & Reisch, L. (2015). Debt out of control: The links between self-control, compulsive buying, and real debts. *Journal of Economic Psychology*, *49*, 141–149. https://doi.org/10.1016/j.joep.2015.04.003

Adriaanse, M. A., Kroese, F. M., Gillebaart, M., & De Ridder, D. T. D. (2014). Effortless inhibition: Habit mediates the relation between self-control and unhealthy snack consumption. *Frontiers in Psychology*, *5*, 1–7. https://doi.org/10.3389/fpsyg.2014.00444

Adriaanse, M. A., Vinkers, C. D. W., De Ridder, D. T. D., Hox, J. J., & De Wit, J. B. F. (2011). Do implementation intentions help to eat a healthy diet? A systematic review and meta-analysis of the empirical evidence. *Appetite*, *56*(1), 183–193. https://doi.org/10.1016/j.appet.2010.10.012

Ajzen, I. (1991). The theory of planned behavior. *Theories of Cognitive Self-Regulation*, *50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Ajzen, I., & Fishbein, M. (1969). The prediction of behavioral intentions in a choice situation. *Journal of Experimental Social Psychology*, *5*(4), 400–416. https://doi.org/10.1016/0022-1031(69)90033-X

Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin*, *84*(5), 888–918. https://doi.org/10.1037/0033-2909.84.5.888

Ajzen, I., & Fishbein, M. (2000). Attitudes and the Attitude-Behavior Relation: Reasoned and Automatic Processes. *European Review of Social Psychology*, *11*(1), 1–33. https://doi.org/10.1080/14792779943000116

Ajzen, I., & Madden, T. J. (1986). Prediction of goal-directed behavior: Attitudes, intentions, and perceived behavioral control. *Journal of Experimental Social Psychology*, *22*(5), 453–474. https://doi.org/10.1016/0022-1031(86)90045-4

Albarracín, D., & Wyer Jr., R. S. (2000). The cognitive impact of past behavior: Influences on beliefs, attitudes, and future behavioral decisions. *Journal of Personality and Social Psychology*, *79*(1), 5–22. https://doi.org/10.1037/0022-3514.79.1.5

Albayrak, T., Aksoy, S., & Caber, M. (2013). The effect of environmental concern and scepticism on green purchase behaviour. *Marketing Intelligence & Planning*, *31*(1), 27–39. https://doi.org/10.1108/02634501311292902

Alexander, J., Crompton, T., & Shrubsole, G. (2011). *Think Of Me As Evil? Opening the Ethical Debates in Advertising*. Public Interest Research Centre and WWF-UK.

Allwood, J. M., Ashby, M. F., Gutowski, T. G., & Worrell, E. (2011). Material efficiency: A white paper. *Resources, Conservation and Recycling*, *55*(3), 362–381. https://doi.org/10.1016/j.resconrec.2010.11.002

Allwood, J. M., Cullen, J. M., & Milford, R. L. (2010). Options for Achieving a 50% Cut in Industrial Carbon Emissions by 2050. *Environmental Science & Technology*, *44*(6), 1888–1894. https://doi.org/10.1021/es902909k

Amburgey, J. W., & Thoman, D. B. (2012). Dimensionality of the New Ecological Paradigm: Issues of Factor Structure and Measurement. *Environment and Behavior*, *44*(2), 235–256. https://doi.org/10.1177/0013916511402064

Anderegg, W. R. L., Prall, J. W., Harold, J., & Schneider, S. H. (2010). Expert credibility in climate change. *Proceedings of the National Academy of Sciences*, *107*(27), 12107. https://doi.org/10.1073/pnas.1003187107

Andersson, E. K., & Moss, T. P. (2011). Imagery and implementation intention: A randomised controlled trial of interventions to increase exercise behaviour in the general population. *Psychology of Sport and Exercise*, *12*(2), 63–70. https://doi.org/10.1016/j.psychsport.2010.07.004

Ariely, D., & Wertenbroch, K. (2002). Procrastination, Deadlines, and Performance: Self-Control by Precommitment. *Psychological Science*, *13*(3), 219–224. https://doi.org/10.1111/1467-9280.00441

Armitage, C. J. (2004). Evidence that implementation intentions reduce dietary fat intake: A randomized trial. *Health Psychology*, *23*(3), 319–323. https://doi.org/10.1037/0278-6133.23.3.319

Armitage, C. J. (2009). Effectiveness of experimenter-provided and self-generated implementation intentions to reduce alcohol consumption in a sample of the general population: a randomized exploratory trial. *Health Psychology*, *28*(5), 545–553. https://doi.org/10.1037/a0015984

Armitage, C. J., & Conner, M. (1999). Predictive validity of the theory of planned behaviour: the role of questionnaire format and social desirability. *Journal of Community & Applied Social Psychology*, *9*(4), 261–272. https://doi.org/10.1002/(SICI)1099-1298(199907/08)9:4<261::AID-CASP503>3.0.CO;2-5

Armitage, C. J., & Conner, M. (2001). Efficacy of the Theory of Planned Behaviour: A meta-analytic review. *British Journal of Social Psychology*, *40*(4), 471–499. https://doi.org/10.1348/014466601164939

Aronson, E., Wilson, T. D., & Akert, R. M. (2007). *Social psychology*, 6th ed. Upper Saddle River, NJ: Pearson Education.

Arvola, A., Vassallo, M., Dean, M., Lampila, P., Saba, A., Lähteenmäki, L., & Shepherd, R. (2008). Predicting intentions to purchase organic food: The role of affective and moral attitudes in the Theory of Planned Behaviour. *Appetite*, *50*(2–3), 443–454. https://doi.org/10.1016/j.appet.2007.09.010

ASC. (2016). *UK Climate Change Risk Assessment 2017 Synthesis report: priorities for the next five years*. London: Adaptation Sub-Committee of the Committee on Climate Change. Retrieved from https://www.theccc.org.uk/tackling-climate-change/preparing-for-climate-change/uk-climate-change-risk-assessment-2017/synthesis-report/

Austin, J. T., Vancouver, J. B., Peterson, C., Roberson, L., Shrout, P., Mone, M., … Jackson, S. (1996). Goal Constructs in Psycholog : Structure, Process, and Content. *Psychological Bulletin*, *120*(3), 338–375.

Axon, S. (2017). “Keeping the ball rolling”: Addressing the enablers of, and barriers to, sustainable lifestyles. *Journal of Environmental Psychology*, *52*, 11–25. https://doi.org/10.1016/j.jenvp.2017.05.002

Babin, L. A., & Burns, A. C. (1997). Effects of Print Ad Pictures and Copy Containing Instructions to Imagine on Mental Imagery That Mediates Attitudes. *Journal of Advertising*, *26*(3), 33–44. https://doi.org/10.1080/00913367.1997.10673527

Bamberg, S. (2002). Implementation intention versus monetary incentive comparing the effects of interventions to promote the purchase of organically produced food. *Journal of Economic Psychology*, *23*(5), 573–587.

Bamberg, S. (2003). How does environmental concern influence specific environmentally related behaviors? A new answer to an old question. *Journal of Environmental Psychology*, *23*(1), 21–32. https://doi.org/10.1016/S0272-4944(02)00078-6

Bamberg, S. (2013a). Applying the stage model of self-regulated behavioral change in a car use reduction intervention. *Journal of Environmental Psychology*, *33*, 68–75. https://doi.org/10.1016/j.jenvp.2012.10.001

Bamberg, S. (2013b). Changing environmentally harmful behaviors: A stage model of self-regulated behavioral change. *Journal of Environmental Psychology*, *34*, 151–159. https://doi.org/10.1016/j.jenvp.2013.01.002

Bamberg, S., & Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology*, *27*(1), 14–25. https://doi.org/10.1016/j.jenvp.2006.12.002

Bamberg, S., & Schmidt, P. (2003). Incentives, Morality, Or Habit? Predicting Students’ Car Use for University Routes With the Models of Ajzen, Schwartz, and Triandis. *Environment and Behavior*, *35*(2), 264–285. https://doi.org/10.1177/0013916502250134

Barbaro, N., & Pickett, S. M. (2015). Mindfully green: Examining the effect of connectedness to nature on the relationship between mindfulness and engagement in pro-environmental behavior. *Personality and Individual Differences*. https://doi.org/10.1016/j.paid.2015.05.026

Bargh, J. A., & Chartrand, T. L. (1999). The unbearable automaticity of being. *American Psychologist*, *54*(7), 462–479. https://doi.org/10.1037/0003-066X.54.7.462

Barnhoorn, J. S., Haasnoot, E., Bocanegra, B. R., & van Steenbergen, H. (2014). QRTEngine: An easy solution for running online reaction time experiments using Qualtrics. *Behavior Research Methods*, *47*(4), 918-929. https://doi.org/10.3758/s13428-014-0530-7

Barr, S. (2007). Factors Influencing Environmental Attitudes and Behaviors. *Environment and Behavior*, *39*(4), 435-473, https://doi.org/10.1177/0013916505283421

Battaglini, M., Bénabou, R., & Tirole, J. (2005). Self-control in peer groups. *Journal of Economic Theory*, *123*(2), 105–134. https://doi.org/10.1016/j.jet.2005.04.001

Baumeister, R. F., Bratslavsky, E., Muraven, M., & Tice, D. M. (1998). Ego depletion: is the active self a limited resource? *Journal of Personality and Social Psychology*, *74*(5), 1252–1265. https://doi.org/10.1037/0022-3514.74.5.1252

Baumeister, R. F. (2002). Yielding to temptation: Self-control failure, impulsive purchasing, and consumer behavior. *Journal of Consumer Research*, *28*(4), 670–676.

Baumeister, R. F. (2014). Self-regulation, ego depletion, and inhibition. *Neuropsychologia*, *65*, 313–319. https://doi.org/10.1016/j.neuropsychologia.2014.08.012

Baumeister, R. F., Gailliot, M., DeWall, C. N., & Oaten, M. (2006). Self-regulation and personality: How interventions increase regulatory success, and how depletion moderates the effects of traits on behavior. *Journal of Personality*, *74*(6), 1773–1801. https://doi.org/10.1111/j.1467-6494.2006.00428.x

Baumeister, R. F., & Heatherton, T. F. (1996). Self-Regulation Failure: An Overview. *Psychological Inquiry*, *7*(1), 1-15.

Baumeister, R. F., Heatherton, T. F., & Tice, D. M. (1994). *Losing control: How and why people fail at self-regulation.* San Diego: Academic Press.

Baumeister, R. F., & Vohs, K. D. (2007). Self-Regulation, Ego Depletion, and Motivation. *Social and Personality Psychology Compass, 1*(1), 115–128. https://doi.org/10.1111/j.1751-9004.2007.00001.x

Baumeister, R. F, Vohs, K. D., & Tice, D. M. (2007). The Strength Model of Self-Control, *Current Directions in Psychological Science, 16*(6), 351–356.

Baumgartner, H., & Pieters, R. (2008). Goal-directed consumer behavior: Motivation, volition, and affect. In *Handbook of consumer psychology*. (pp. 367–392). New York: Taylor & Francis Group/Lawrence Erlbaum Associates.

Bayer, U. C., Achtziger, A., Gollwitzer, P. M., & Moskowitz, G. B. (2009). Responding to Subliminal Cues: Do If-Then Plans Facilitate Action Preparation and Initiation without Conscious Intent? *Social Cognition*, *27*(2), 183–201. https://doi.org/10.1521/soco.2009.27.2.183

Behrend, T. S., Sharek, D. J., Meade, A. W., & Wiebe, E. N. (2011). The viability of crowdsourcing for survey research. *Behavior Research Methods*, *43*(3), 800–813. https://doi.org/10.3758/s13428-011-0081-0

Bélanger-Gravel, A., Godin, G., & Amireault, S. (2011). A meta-analytic review of the effect of implementation intentions on physical activity. *Health Psychology Review, 7*(1), 23-54, https://doi.org/10.1080/17437199.2011.560095

Bell, B. T., Toth, N., Little, L., & Smith, M. A. (2016). Planning to Save the Planet: Using an Online Intervention Based on Implementation Intentions to Change Adolescent Self-Reported Energy-Saving Behavior. *Environment and Behavior*, *48*(8), 1049–1072. https://doi.org/10.1177/0013916515583550

Bernecker, K., & Job, V. (2015). Beliefs about willpower moderate the effect of previous day demands on next day's expectations and effective goal striving. *Frontiers in Psychology*, *6*. https://doi.org/10.3389/fpsyg.2015.01496

Bertrams, A. (2012). How minimal grade goals and self-control capacity interact in predicting test grades. *Learning and Individual Differences*, *22*(6), 833–838. https://doi.org/10.1016/j.lindif.2012.07.003

Best, H., & Mayerl, J. (2013). Values, beliefs, attitudes: An empirical study on the structure of environmental concern and recycling participation. *Social Science Quarterly*, *94*(3), 691–714. https://doi.org/10.1111/ssqu.12010

Beute, F., & de Kort, Y. A. W. (2014). Natural resistance: Exposure to nature and self-regulation, mood, and physiology after ego-depletion. *Journal of Environmental Psychology*, *40*, 167–178. https://doi.org/10.1016/j.jenvp.2014.06.004

Blake, J. (1999). Overcoming the 'value-action gap' in environmental policy: Tensions between national policy and local experience. *Local Environment*, *4*(3), 257–278. https://doi.org/10.1080/13549839908725599

Boals, A., vanDellen, M. R., & Banks, J. B. (2011). The relationship between self-control and health: The mediating effect of avoidant coping. *Psychology & Health*, *26*(8), 1049–1062. https://doi.org/10.1080/08870446.2010.529139

Brandstatter, V., Lengfelder, A., & Gollwitzer, P. M. (2001). Implementation Intentions and Efficient Action Initiation. *Journal of Personality and Social Psychology*, *81*(5), 946–960. https://doi.org/10.1037//0022-35I4.81.5.946

Bratanova, B., Loughnan, S., & Gatersleben, B. (2012). The moral circle as a common motivational cause of cross-situational pro-environmentalism. *European Journal of Social Psychology*, *42*(5), 539–545. https://doi.org/10.1002/ejsp.1871

Breneiser, J. (2009). Implementation Intentions and Generative Strategies in Prospective Memory Retrieval. *North American Journal of Psychology*, *11*(2), 401–418.

Brick, C., & Lewis, G. J. (2016). Unearthing the "green" personality: Core traits predict environmentally-friendly behavior. *Environment and Behavior*, *48*(5), 635–658.

Brown, H. R., Zeidman, P., Smittenaar, P., Adams, R. A., McNab, F., Rutledge, R. B., & Dolan, R. J. (2014). Crowdsourcing for Cognitive Science – The Utility of Smartphones. *PLoS ONE*, *9*(7), e100662. https://doi.org/10.1371/journal.pone.0100662

Buchanan, T., Ali, T., Heffernan, T. M., Ling, J., Parrott, A. C., Rodgers, J., & Scholey, A. B. (2005). Nonequivalence of on-line and paper-and-pencil psychological tests: The case of the prospective memory questionnaire. *Behavior Research Methods*, *37*(1), 148–154. https://doi.org/10.3758/BF03206409

Buchanan, T., & Smith, J. L. (1999). Using the Internet for psychological research: Personality testing on the World Wide Web. *British Journal of Psychology*, *90*(1), 125–144. https://doi.org/10.1348/000712699161189

Budeanu, A. (2007). Sustainable tourist behaviour – a discussion of opportunities for change. *International Journal of Consumer Studies*, *31*, 499–508. https://doi.org/10.1111/j.1470-6431.2007.00606.x

Buhrmester, M., Kwang, T., & Gosling, S. D. (2011). Amazon's Mechanical Turk: A New Source of Inexpensive, Yet High-Quality, Data? *Perspectives on Psychological Science*, *6*(1), 3–5. https://doi.org/10.1177/1745691610393980

Burchell, K., Rettie, R., & Patel, K. (2013). Marketing social norms: Social marketing and the 'social norm approach': Marketing social norms. *Journal of Consumer Behaviour*, *12*(1), 1–9. https://doi.org/10.1002/cb.1395

Burkard, C., Rochat, L., Emmenegger, J., Juillerat Van der Linden, A. C., Gold, G., & Van der Linden, M. (2014). Implementation intentions improve prospective memory and inhibition performances in older adults: The role of visualization. *Applied Cognitive Psychology*, *28*(5), 640–652. https://doi.org/10.1002/acp.3046

Burkard, C., Rochat, L., & Van der Linden, M. (2013). Enhancing inhibition: How impulsivity and emotional activation interact with different implementation intentions. *Acta Psychologica*, *144*(2), 291–297. https://doi.org/10.1016/j.actpsy.2013.07.008

Burns, A. C., Biswas, A., & Babin, L. A. (1993). The Operation of Visual Imagery as a Mediator of Advertising Effects. *Journal of Advertising*, *22*(2), 71–85. https://doi.org/10.1080/00913367.1993.10673405

Busic-Sontic, A., Czap, N. V., & Fuerst, F. (2017). The role of personality traits in green decision-making. *Journal of Economic Psychology*, *62*, 313–328. https://doi.org/10.1016/j.joep.2017.06.012

Byerly, H., Balmford, A., Ferraro, P. J., Hammond Wagner, C., Palchak, E., Polasky, S., … Fisher, B. (2018). Nudging pro-environmental behavior: evidence and opportunities. *Frontiers in Ecology and the Environment*, *16*(3), 159–168. https://doi.org/10.1002/fee.1777

Carfora, V., Caso, D., Sparks, P., & Conner, M. (2017). Moderating effects of pro-environmental self-identity on pro-environmental intentions and behaviour: A multi-behaviour study. *Journal of Environmental Psychology*, *53*, 92–99. https://doi.org/10.1016/j.jenvp.2017.07.001

Carrington, M. J., Neville, B. A., & Whitwell, G. J. (2010). Why ethical consumers don't walk their talk: Towards a framework for understanding the gap between the ethical purchase intentions and actual buying behaviour of ethically minded consumers. *Journal of Business Ethics*, *97*(1), 139–158. https://doi.org/10.1007/s10551-010-0501-6

Carrington, M. J., Neville, B. A., & Whitwell, G. J. (2014). Lost in translation: Exploring the ethical consumer intention-behavior gap. *Journal of Business Research*, *67*(1), 2759–2767. https://doi.org/10.1016/j.jbusres.2012.09.022

Carrus, G., Passafaro, P., & Bonnes, M. (2008). Emotions, habits and rational choices in ecological behaviours: The case of recycling and use of public transportation. *Journal of Environmental Psychology*, *28*(1), 51–62. https://doi.org/10.1016/j.jenvp.2007.09.003

Carter, E. C., & McCullough, M. E. (2014). Publication bias and the limited strength model of self-control: has the evidence for ego depletion been overestimated? *Frontiers in Psychology*, *5*. https://doi.org/10.3389/fpsyg.2014.00823

Carver, C. S., & Scheier, M. F. (1990). Origins and functions of positive and negative affect: A control-process view. *Psychological Review*, *97*(1), 19–35. https://doi.org/10.1037/0033-295X.97.1.19

Carver, C. S., & Scheier, M. F. (2000). Chapter 3 - On the Structure of Behavioral Self-Regulation. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of Self-Regulation* (pp. 41–84). San Diego: Academic Press. https://doi.org/10.1016/B978-012109890-2/50032-9

Casey, P. J., & Scott, K. (2006). Environmental concern and behaviour in an Australian sample within an ecocentric - anthropocentric framework. *Australian Journal of Psychology*, *58*(2), 57–67. https://doi.org/10.1080/00049530600730419

Casler, K., Bickel, L., & Hackett, E. (2013). Separate but equal? A comparison of participants and data gathered via Amazon's MTurk, social media, and face-to-face behavioral testing. *Computers in Human Behavior*, *29*(6), 2156–2160. https://doi.org/10.1016/j.chb.2013.05.009

CCC. (2015). *The Fifth Carbon Budget. The next step towards a low-carbon economy*. London: Committee on Climate Change. Retrieved from https://www.theccc.org.uk/publication/the-fifth-carbon-budget-the-next-step-towards-a-low-carbon-economy/

Chan, L., & Bishop, B. (2013). A moral basis for recycling: Extending the theory of planned behaviour. *Journal of Environmental Psychology*, *36*, 96–102. https://doi.org/10.1016/j.jenvp.2013.07.010

Chandler, J. J., & Paolacci, G. (2017). Lie for a Dime: When Most Prescreening Responses Are Honest but Most Study Participants Are Impostors. *Social Psychological and Personality Science*, *8*(5), 500–508. https://doi.org/10.1177/1948550617698203

Chandler, J., & Shapiro, D. (2016). Conducting Clinical Research Using Crowdsourced Convenience Samples. *Annual Review of Clinical Psychology*, *12*(1), 53–81. https://doi.org/10.1146/annurev-clinpsy-021815-093623

Chartrand, T. L. (2005). The Role of Conscious Awareness in Consumer Behavior. *Journal of Consumer Psychology*, *15*(3), 203–210. https://doi.org/10.1207/s15327663jcp1503_4

Chartrand, T. L., & Bargh, J. A. (1999). The Chameleon Effect: The Perception-Behaviour Link and Social Interaction. *Journal of Personality and Social Psychology*, *76*(6), 893–910. https://doi.org/10.1037/0022-3514.76.6.893

Chatzisarantis, N. L. D., & Hagger, M. S. (2005). Effects of a Brief Intervention Based on the Theory of Planned Behavior on Leisure-Time Physical Activity Participation. *Journal of Sport and Exercise Psychology*, *27*(4), 470–487. https://doi.org/10.1123/jsep.27.4.470

Chen, M. F. (2016). Extending the theory of planned behavior model to explain people's energy savings and carbon reduction behavioral intentions to mitigate climate change in Taiwan–moral obligation matters. *Journal of Cleaner Production*, *112*, 1746–1753. https://doi.org/10.1016/j.jclepro.2015.07.043

Chen, M. F., & Tung, P.J. (2010). The Moderating Effect of Perceived Lack of Facilities on Consumers' Recycling Intentions. *Environment and Behavior*, *42*(6), 824–844. https://doi.org/10.1177/0013916509352833

Chuang, Y., Xie, X., & Liu, C. (2016). Interdependent orientations increase pro-environmental preferences when facing self-interest conflicts: The mediating role of self-control. Journal of Environmental Psychology, *46*, 96–105. https://doi.org/10.1016/j.jenvp.2016.04.001

Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology*, *58*(6), 1015–1026. https://doi.org/10.1037/0022-3514.58.6.1015

Clark, C. F., Kotchen, M. J., & Moore, M. R. (2003). Internal and external influences on pro-environmental behavior: Participation in a green electricity program. *Journal of Environmental Psychology*, *23*(3), 237–246. https://doi.org/10.1016/S0272-4944(02)00105-6

Clarkson, J. J., Otto, A. S., Hassey, R., & Hirt, E. R. (2016). Perceived mental fatigue and self-control. In E. R. Hirt, J. J. Clarkson, & L. Jia (Eds.), *Self-regulation and ego control* (pp. 185-202). San Diego: Elsevier Academic Press.

Clee, M. A., & Wicklund, R. A. (1980). Consumer Behavior and Psychological Reactance. *Journal of Consumer Research*, *6*(4), 389–405.

Cohen, A. L., Bayer, U. C., Jaudas, A., & Gollwitzer, P. M. (2008). Self-regulatory strategy and executive control: Implementation intentions modulate task switching and Simon task performance. *Psychological Research*, *72*(1), 12–26. https://doi.org/10.1007/s00426-006-0074-2

Cohen, J. (1988). *Statistical power analysis for the behavioral science* (2nd ed). New Jersey: Lawrence Erlbaum.

Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*(1), 155–159. https://doi.org/10.1037/0033-2909.112.1.155

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed). Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.

Cook, A., Kerr, G., & Moore, K. (2002). Attitudes and intentions towards purchasing GM food. *Journal of Economic Psychology*, *23*(5), 557–572. https://doi.org/10.1016/S0167-4870(02)00117-4

Cook, J., Nuccitelli, D., Green, S. A., Richardson, M., Winkler, B., Painting, R., … Skuce, A. (2013). Quantifying the consensus on anthropogenic global warming in the scientific literature. *Environmental Research Letters*, *8*(2), 024024.

Cooper, S. B., Bandelow, S., & Nevill, M. E. (2011). Breakfast consumption and cognitive function in adolescent schoolchildren. *Physiology & Behavior*, *103*(5), 431–439. https://doi.org/10.1016/j.physbeh.2011.03.018

Corner, A., & Randall, A. (2011). Selling climate change? The limitations of social marketing as a strategy for climate change public engagement. *Global Environmental Change*, *21*(3), 1005–1014. https://doi.org/10.1016/j.gloenvcha.2011.05.002

Coulter, R. H., & Zaltman, R. (1994). Using The Zaltman Metaphor Elicitation Technique to Understand Brand Images. *Advances In Consumer Research*, *21*(1), 501–507.

Crescioni, A. W., Ehrlinger, J., Alquist, J. L., Conlon, K. E., Baumeister, R. F., Schatschneider, C., & Dutton, G. R. (2011). High trait self-control predicts positive health behaviors and success in weight loss. *Journal of Health Psychology*, *16*(5), 750–759. https://doi.org/10.1177/1359105310390247

Crump, M. J. C., McDonnell, J. V., & Gureckis, T. M. (2013). Evaluating Amazon's Mechanical Turk as a Tool for Experimental Behavioral Research. *PLoS ONE*, *8*(3), e57410. https://doi.org/10.1371/journal.pone.0057410

Danaher, P. J., & Dagger, T. S. (2013). Comparing the Relative Effectiveness of Advertising Channels: A Case Study of a Multimedia Blitz Campaign. *Journal of Marketing Research*, *50*(4), 517–534. https://doi.org/10.1509/jmr.12.0241

Dang, J. (2016). Testing the role of glucose in self-control: A meta-analysis. *Appetite*, *107*, 222–230. https://doi.org/10.1016/j.appet.2016.07.021

Danner, U. N., Aarts, H., & de Vries, N. K. (2008). Habit vs. intention in the prediction of future behaviour: The role of frequency, context stability and mental accessibility of past behaviour. *British Journal of Social Psychology*, *47*(2), 245–265. https://doi.org/10.1348/014466607X230876

Davidson, D. J., Zacks, R. T., & Williams, C. C. (2003). Stroop Interference, practice and aging. *Neuropsychology, development and cognition. Section B, Aging Neuropsychology and Cognition*, *10*(2), 85-98.

De Groot, J. I. M., & Steg, L. (2007). Value Orientations and Environmental Beliefs in Five Countries: Validity of an Instrument to Measure Egoistic, Altruistic and Biospheric Value Orientations. *Journal of Cross-Cultural Psychology*, *38*(3), 318–332. https://doi.org/10.1177/0022022107300278

De Groot, J. I. M., & Steg, L. (2010). Relationships between value orientations, self-determined motivational types and pro-environmental behavioural intentions. *Journal of Environmental Psychology*, *30*(4), 368–378. https://doi.org/10.1016/j.jenvp.2010.04.002

De Groot, J. I. M., & Steg, L. (2009). Morality and prosocial behavior: The role of awareness, responsibility, and norms in the norm activation model. *Journal of Social Psychology*, *149*(4), 425–449. https://doi.org/10.3200/SOCP.149.4.425-449

De Groot, J. I. M., & Steg, L. (2008). Value Orientations to Explain Beliefs Related to Environmental Significant Behavior: How to Measure Egoistic, Altruistic, and Biospheric Value Orientations. *Environment and Behavior*, *40*(3), 330–354. https://doi.org/10.1177/0013916506297831

de Leeuw, A., Valois, P., Ajzen, I., & Schmidt, P. (2015). Using the theory of planned behavior to identify key beliefs underlying pro-environmental behavior in high-school students: Implications for educational interventions. *Journal of Environmental Psychology*, *42*, 128–138. https://doi.org/10.1016/j.jenvp.2015.03.005

de Nooijer, J., de Vet, E., Brug, J., & de Vries, N. K. (2006). Do Implementation Intentions Help to Turn Good Intentions into Higher Fruit Intakes? *Journal of Nutrition Education and Behavior*, *38*(1), 25–29. https://doi.org/10.1016/j.jneb.2005.11.021

de Ridder, D. T. D., Kroese, F., & Gillebaart, M. (2018). Whatever happened to self-control? A proposal for integrating notions from trait self-control studies into state self-control research. *Motivation Science*, *4*(1), 39–49. https://doi.org/10.1037/mot0000062

de Ridder, D. T. D., de Boer, B. J., Lugtig, P., Bakker, A. B., & van Hooft, E. A. J. (2011). Not doing bad things is not equivalent to doing the right thing: Distinguishing between

inhibitory and initiatory self-control. *Personality and Individual Differences*, *50*(7), 1006–1011. https://doi.org/10.1016/j.paid.2011.01.015

de Ridder, D. T. D., Lensvelt-Mulders, G., Finkenauer, C., Stok, F. M., & Baumeister, R. F. (2012). Taking stock of self-control: A meta-analysis of how trait self-control relates to a wide range of behaviors. *Personality and Social Psychology Review*, *16*(1), 76–99. https://doi.org/10.1177/1088868311418749

DeBono, A., Shmueli, D., & Muraven, M. (2010). Rude and Inappropriate: The Role of Self-Control in Following Social Norms. *Personality and Social Psychology Bulletin,* 37(1), 136–146. https://doi.org/10.1177/0146167210391478

Delmas, M. A., Fischlein, M., & Asensio, O. I. (2013). Information strategies and energy conservation behavior: A meta-analysis of experimental studies from 1975 to 2012. *Energy Policy*, *61*, 729–739. https://doi.org/10.1016/j.enpol.2013.05.109

Dewall, C. N., Baumeister, R. F., Gailliot, M. T., & Maner, J. K. (2008). Depletion makes the heart grow less helpful: helping as a function of self-regulatory energy and genetic relatedness. *Personality and Social Psychology Bulletin*, *34*(12), 1653–1662. https://doi.org/10.1177/0146167208323981

DeWall, C. N., Baumeister, R. F., Stillman, T. F., & Gailliot, M. T. (2007). Violence restrained: Effects of self-regulation and its depletion on aggression. *Journal of Experimental Social Psychology*, *43*(1), 62–76. https://doi.org/10.1016/j.jesp.2005.12.005

Dhar, R., & Wertenbroch, K. (2012). Self-Signaling and the Costs and Benefits of Temptation in Consumer Choice. *Journal of Marketing Research*, *49*(1), 15–25. https://doi.org/10.1509/jmr.10.0490

Diamond, A., & Lee, K. (2011). Interventions Shown to Aid Executive Function Development in Children 4 to 12 Years Old. *Science*, *333*(6045), 959–964. https://doi.org/10.1126/science.1204529

Dono, J., Webb, J., & Richardson, B. (2010). The relationship between environmental activism, pro-environmental behaviour and social identity. *Journal of Environmental Psychology*, 30(2), 178–186. https://doi.org/10.1016/j.jenvp.2009.11.006

Duckworth, A. L. (2011). The significance of self-control. *Proceedings of the National Academy of Sciences*, *108*(7), 2639. https://doi.org/10.1073/pnas.1019725108

Duckworth, A. L., Gendler, T. S., & Gross, J. J. (2016). Situational Strategies for Self-Control. *Perspectives on Psychological Science*, *11*(1), 35–55. https://doi.org/10.1177/1745691615623247

Duckworth, A. L., & Seligman, M. E. P. (2005). Self-discipline outdoes IQ in predicting academic performance of adolescents. *Psychological Science*, *16*(12), 939–944. https://doi.org/10.1111/j.1467-9280.2005.01641.x

Duckworth, A. L., & Kern, M. L. (2011). A meta-analysis of the convergent validity of self-control measures. *Journal of Research in Personality*, *45*(3), 259–268. https://doi.org/10.1016/j.jrp.2011.02.004

Dunlap, R. E., & Jones, R. E. (2002). Environmental concern: conceptual and measurement issues. In R.E. Dunlap & W. Michelson (Eds.), *Handbook of environmental sociology* (pp. 482–524). Westport, CT: Greenwood Press.

Dunlap, R. E., Van Liere, K. D., Mertig, A. G., & Jones, R. E. (2000). Measuring endorsement of the new ecological paradigm: A revised NEP scale. *Journal of Social Issues*, *56*(3), 425–442. https://doi.org/10.1111/0022-4537.00176

Ebreo, A., Hershey, J., & Vining, J. (1999). Reducing Solid Waste: Linking Recycling to Environmentally Responsible Consumerism. *Environment and Behavior*, *31*(1), 107–135. https://doi.org/10.1177/00139169921972029

Ebreo, A., & Vining, J. (2001). How Similar are Recycling and Waste Reduction?: Future Orientation and Reasons for Reducing Waste As Predictors of Self-Reported Behavior. *Environment and Behavior*, 33(3), 424–448. https://doi.org/10.1177/00139160121973061

Echambadi, R., & Hess, J. D. (2007). Mean-Centering Does Not Alleviate Collinearity Problems in Moderated Multiple Regression Models. *Marketing Science*, *26*(3), 438–445. https://doi.org/10.1287/mksc.1060.0263

Eder, A. B. (2011). Control of impulsive emotional behaviour through implementation intentions. *Cognition & Emotion*, *25*(3), 478–489. https://doi.org/10.1080/02699931.2010.527493

Egbue, O., & Long, S. (2012). Barriers to widespread adoption of electric vehicles: An analysis of consumer attitudes and perceptions. *Energy Policy*, *48*(2012), 717–729. https://doi.org/10.1016/j.enpol.2012.06.009

Egloff, B., & Hock, M. (2003). Assessing attention allocation toward threat-related stimuli: a comparison of the emotional Stroop task and the attentional probe task. *Personality and Individual Differences*, *35*(2), 475–483. https://doi.org/10.1016/S0191-8869(02)00265-9

Ein-Gar, D. (2015). Committing under the shadow of tomorrow: Self-control and commitment to future virtuous behaviors. *Journal of Consumer Psychology*, *25*(2), 268–285. https://doi.org/10.1016/j.jcps.2014.08.006

Ein-Gar, D., Goldenberg, J., & Sagiv, L. (2012). The role of consumer self-control in the consumption of virtue products. *International Journal of Research in Marketing*, *29*(2), 123–133. https://doi.org/10.1016/j.ijresmar.2011.08.003

Ein-Gar, D., & Steinhart, Y. (2011). The 'Sprinter effect': When self-control and involvement stand in the way of sequential performance. *Journal of Consumer Psychology*, *21*(3), 240–255. https://doi.org/10.1016/j.jcps.2010.11.003

Ein-Gar, D., & Steinhart, Y. (2017). Self-control and Task Timing Shift Self-efficacy and Influence Willingness to Engage in Effortful Tasks. *Frontiers in Psychology*, *8*. https://doi.org/10.3389/fpsyg.2017.01788

Elster, J. (1989). Social Norms and Economic Theory. *The Journal of Economic Perspectives*, *3*(4), 99–117.

Ent, M. R., Baumeister, R. F., & Tice, D. M. (2015). Trait self-control and the avoidance of temptation. *Personality and Individual Differences*, *74*, 12–15. https://doi.org/10.1016/j.paid.2014.09.031

Escalas, J. E., & Luce, M. F. (2004). Understanding the Effects of Process-Focused versus Outcome-Focused Thought in Response to Advertising. *Journal of Consumer Research*, *31*(2), 274–285. https://doi.org/10.1086/422107

European Commission. (2017). *Attitudes of European citizens towards the environment - Special Eurobarometer 468*. Directorate-General for Communication, European Union.

Ewert, A., & Galloway, G. (2009). Socially desirable responding in an environmental context: development of a domain specific scale. *Environmental Education Research*, *15*(1), 55–70. https://doi.org/10.1080/13504620802613504

Faber, J., Schroten, A., Bles, M., Sevenster, M., Markowska,A., Smit, M., … Köhler, J. (2012). Behavioural climate change mitigation options and their appropriate inclusion in quantitative longer term policy scenarios. Report commissioned by the European Commission. CE Delft.

Farrelly, T., & Tucker, C. (2014). Action research and residential waste minimisation in Palmerston North, New Zealand. *Resources, Conservation and Recycling*, *91*, 11–26. https://doi.org/10.1016/j.resconrec.2014.07.003

Farrow, K., Grolleau, G., & Ibanez, L. (2017). Social Norms and Pro-environmental Behavior: A Review of the Evidence. *Ecological Economics*, *140*, 1–13. https://doi.org/10.1016/j.ecolecon.2017.04.017

Faul, F., Erdfelder, E., Lang, A.G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175-191.

Fennis, B. M., Adriaanse, M. A., Stroebe, W., & Pol, B. (2011). Bridging the intention–behavior gap: Inducing implementation intentions through persuasive appeals. *Journal of Consumer Psychology*, *21*(3), 302–311. https://doi.org/10.1016/j.jcps.2010.12.003

Fennis, B. M., Das, E., & Fransen, M. L. (2012). Print advertising: Vivid content. *Journal of Business Research*, *65*(6), 861–864. https://doi.org/10.1016/j.jbusres.2011.01.008

Field, A. (2018). *Discovering Statistics Using IBM SPSS Statistics* (5th ed.). London: Sage Publications.

Fielding, K. S., & Hornsey, M. J. (2016). A Social Identity Analysis of Climate Change and Environmental Attitudes and Behaviors: Insights and Opportunities. *Frontiers in Psychology*, *7*, 121. https://doi.org/10.3389/fpsyg.2016.00121

Fishbach, A., Friedman, R. S., & Kruglanski, A. W. (2003). Leading us not into temptation: Momentary allurements elicit overriding goal activation. *Journal of Personality and Social Psychology*, *84*(2), 296–309. https://doi.org/10.1037/0022-3514.84.2.296

Fishbach, A., & Shah, J. Y. (2006). Self-control in action: implicit dispositions toward goals and away from temptations. *Journal of Personality and Social Psychology*, *90*(5), 820–832. https://doi.org/10.1037/0022-3514.90.5.820

Fishbach, A., & Trope, Y. (2005). The substitutability of external control and self-control. *Journal of Experimental Social Psychology*, *41*(3), 256–270. https://doi.org/10.1016/j.jesp.2004.07.002

Fishbach, A., & Zhang, Y. (2008). Together or apart: When goals and temptations complement versus compete. *Journal of Personality and Social Psychology*, *94*(4), 547–559. https://doi.org/10.1037/0022-3514.94.4.547

Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach.* New York: Psychology Press.

Forestier, C., Sarrazin, P., Allenet, B., Gauchet, A., Heuzé, J.-P., & Chalabaev, A. (2018). “Are you in full possession of your capacity?”. A mechanistic self-control approach at trait

and state levels to predict different health behaviors. *Personality and Individual Differences*, *134*, 214–221. https://doi.org/10.1016/j.paid.2018.05.044

Fornara, F., Pattitoni, P., Mura, M., & Strazzera, E. (2016). Predicting intention to improve household energy efficiency: The role of value-belief-norm theory, normative and informational influence, and specific attitude. *Journal of Environmental Psychology*, *45*, 1–10. https://doi.org/10.1016/j.jenvp.2015.11.001

Fujita, K. (2011). On Conceptualizing Self-Control as More Than the Effortful Inhibition of Impulses. *Personality and Social Psychology Review*, *15*(4), 352–366. https://doi.org/10.1177/1088868311411165

Fujita, K., & Han, H. A. (2009). Moving Beyond Deliberative Control of Impulses: The Effect of Construal Levels on Evaluative Associations in Self-Control Conflicts. *Psychological Science*, *20*(7), 799–804. https://doi.org/10.1111/j.1467-9280.2009.02372.x

Fujita, K., Trope, Y., Liberman, N., & Levin-Sagi, M. (2006). Construal levels and self-control. *Journal of Personality and Social Psychology*, *90*(3), 351–367. https://doi.org/10.1037/0022-3514.90.3.351

Gailliot, M. T., & Baumeister, R. F. (2007). The Physiology of Willpower: Linking Blood Glucose to Self-Control. *Personality and Social Psychology Review*, *11*(4), 303–327. https://doi.org/10.1177/1088868307303030

Gailliot, M. T., Baumeister, R. F., DeWall, C. N., Maner, J. K., Plant, E. A., Tice, D. M., … Schmeichel, B. J. (2007). Self-control relies on glucose as a limited energy source: willpower is more than a metaphor. *Journal of Personality and Social Psychology*, *92*(2), 325–336. https://doi.org/10.1037/0022-3514.92.2.325

Galla, B. M., & Duckworth, A. L. (2015). More than resisting temptation: Beneficial habits mediate the relationship between self-control and positive life outcomes. *Journal of Personality and Social Psychology*, *109*(3), 508–525. https://doi.org/10.1037/pspp0000026

Garcés, C., Lafuente, A., Pedraja, M., & Rivera, P. (2002). Urban Waste Recycling Behavior: Antecedents of Participation in a Selective Collection Program. *Environmental Management*, *30*(3), 378–390. https://doi.org/10.1007/s00267-002-2601-2

Gardner, G. T., & Stern, P. C. (1996). Environmental problems and human behavior. Needham Heights: Allyn & Bacon.

Gardner, G. T., & Stern, P. C. (2008). The Short List: The Most Effective Actions U.S. Households Can Take to Curb Climate Change. *Environment: Science and Policy for Sustainable Development*, *50*(5), 12–25. https://doi.org/10.3200/ENVT.50.5.12-25

Gatersleben, B., Murtagh, N., & Abrahamse, W. (2014). Values, identity and pro-environmental behaviour. *Contemporary Social Science*, *9*(4), 374–392. https://doi.org/10.1080/21582041.2012.682086

Gatersleben, B., Murtagh, N., Cherry, M., & Watkins, M. (2017). Moral, Wasteful, Frugal, or Thrifty? Identifying Consumer Identities to Understand and Manage Pro-Environmental Behavior. *Environment and Behavior*, *51*(1), 24–49. https://doi.org/10.1177/0013916517733782

Gatersleben, B., Steg, L., & Vlek, C. (2002). Measurement and Determinants of Environmentally Significant Consumer Behavior. *Environment and Behavior*, *34*(3), 335–362. https://doi.org/10.1177/0013916502034003004

Gatersleben, B., & Uzzell, D. (2007). Affective Appraisals of the Daily Commute: Comparing Perceptions of Drivers, Cyclists, Walkers, and Users of Public Transport. *Environment and Behavior*, *39*(3), 416–431. https://doi.org/10.1177/0013916506294032

Gatersleben, B., White, E., Abrahamse, W., Jackson, T., & Uzzell, D. (2010). Values and sustainable lifestyles. *Architectural Science Review*, *53*(1), 37–50. https://doi.org/10.3763/asre.2009.0101

Germine, L., Nakayama, K., Duchaine, B. C., Chabris, C. F., Chatterjee, G., & Wilmer, J. B. (2012). Is the Web as good as the lab? Comparable performance from Web and lab in

cognitive/perceptual experiments. *Psychonomic Bulletin & Review*, *19*(5), 847–857. https://doi.org/10.3758/s13423-012-0296-9

Gerrits, J. H., O'Hara, R. E., Piko, B. F., Gibbons, F. X., de Ridder, D. T. D., Keresztes, N., … de Wit, J. B. F. (2010). Self-control, diet concerns and eater prototypes influence fatty foods consumption of adolescents in three countries. *Health Education Research*, *25*(6), 1031–1041. https://doi.org/10.1093/her/cyq055

Geyer, R., Jambeck, J. R., & Law, K. L. (2017). Production, use, and fate of all plastics ever made. *Science Advances*, *3*(7), e1700782. https://doi.org/10.1126/sciadv.1700782

Giese, H., König, L. M., Tăut, D., Ollila, H., Băban, A., Absetz, P., … Renner, B. (2015). Exploring the Association between Television Advertising of Healthy and Unhealthy Foods, Self-Control, and Food Intake in Three European Countries: TV Advertising, Self-Control, and Food Intake. *Applied Psychology: Health and Well-Being*, *7*(1), 41–62. https://doi.org/10.1111/aphw.12036

Gifford, R. (2011). The dragons of inaction: psychological barriers that limit climate change mitigation and adaptation. *American Psychologist*, *66*(4), 290–302. https://doi.org/10.1037/a0023566

Gifford, R., Kormos, C., & McIntyre, A. (2011). Behavioral dimensions of climate change: drivers, responses, barriers, and interventions. *Wiley Interdisciplinary Reviews: Climate Change*, *2*(6), 801–827. https://doi.org/10.1002/wcc.143

Gifford, R., & Nilsson, A. (2014). Personal and social factors that influence pro-environmental concern and behaviour: A review. *International Journal of Psychology*, *49*(3), 141-157. https://doi.org/10.1002/ijop.12034

Gilbert, D. T., & Osborne, R. E. (1989). Thinking backward: Some curable and incurable consequences of cognitive busyness. *Journal of Personality and Social Psychology*, *57*(6), 940–949. https://doi.org/10.1037/0022-3514.57.6.940

Gillebaart, M., & Adriaanse, M. A. (2017). Self-control predicts exercise behavior by force of habit, a conceptual replication of Adriaanse et al. (2014). *Frontiers in Psychology*, *8*. https://doi.org/10.3389/fpsyg.2017.00190

Gillebaart, M., Schneider, I. K., & De Ridder, D. T. D. (2016). Effects of Trait Self-Control on Response Conflict About Healthy and Unhealthy Food: Trait Self-Control and Response Conflict. *Journal of Personality*, *84*(6), 789–798. https://doi.org/10.1111/jopy.12219

Gleim, M. R., & J. Lawson, S. (2014). Spanning the gap: an examination of the factors leading to the green gap. *Journal of Consumer Marketing*, *31*(6/7), 503–514. https://doi.org/10.1108/JCM-05-2014-0988

Gleim, M. R., Smith, J. S., Andrews, D., & Cronin, J. J. (2013). Against the Green: A Multi-method Examination of the Barriers to Green Consumption. *Journal of Retailing*, *89*(1), 44–61. https://doi.org/10.1016/j.jretai.2012.10.001

Goldstein, N. J., Cialdini, R. B., & Griskevicius, V. (2008). A Room with a Viewpoint: Using Social Norms to Motivate Environmental Conservation in Hotels. *Journal of Consumer Research*, *35*(3), 472–482. https://doi.org/10.1086/586910

Gollwitzer, P. M., & Schaal, B. (1998). Metacognition in action: the importance of implementation intentions. *Personality and Social Psychology Review*, *2*(2), 124-136. https://doi.org/10.1207/s15327957pspr0202_5

Gollwitzer, P. M. (1990). Action phases and mind-sets. In E. T. Higgins & R. M. Sorrentino (Eds.), *Handbook of motivation and cognition: Foundations of social behavior, Vol. 2.* (pp. 53–92). New York: Guilford Press.

Gollwitzer, P. M. (1996). The volitional benefits of planning. In P. M. Gollwitzer & J. A. Bargh (Eds.), *The psychology of action: Linking cognition and motivation to behavior* (pp. 287-312). New York: Guilford Press.

Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist*, *54*(7), 493.

Gollwitzer, P. M., & Brandstätter, V. (1997). Implementation intentions and effective goal pursuit. *Journal of Personality and Social Psychology*, *73*(1), 186.

Gollwitzer, P. M., & Moskowitz, G. B. (1996). Goal effects on action and cognition. In E.T. Higgins & A. Kruglanski (Eds), *Social Psychology: Handbook of Basic Principles* (pp. 361–399). New York: Guildford Press.

Gollwitzer, P. M., & Sheeran, P. (2006). Implementation Intentions and Goal Achievement: A Meta-analysis of Effects and Processes. *Advances in Experimental Social Psychology*, *38*(06), 69–119. https://doi.org/10.1016/S0065-2601(06)38002-1

Gollwitzer, P. M., & Sheeran, P. (2009). Self-regulation of consumer decision making and behavior: The role of implementation intentions. *Journal of Consumer Psychology*, *19*(4), 593–607. https://doi.org/10.1016/j.jcps.2009.08.004

Gollwitzer P. M., & Brandstatter, V. (1997). Implementation Intention and Effective Goal Pursuit. *Journal of Personality and Social Psychology 73(1)*, *73*(1), 186–199.

Goodman, J. K., & Paolacci, G. (2017). Crowdsourcing Consumer Research. *Journal of Consumer Research*, *44*(1), 196–210. https://doi.org/10.1093/jcr/ucx047

Gordon, R., McDermott, L., Stead, M., & Angus, K. (2006). The effectiveness of social marketing interventions for health improvement: What's the evidence? *Public Health*, *120*(12), 1133–1139. https://doi.org/10.1016/j.puhe.2006.10.008

Gosling, S. D., & Mason, W. (2015). Internet Research in Psychology. *Annual Review of Psychology*, *66*(1), 877–902. https://doi.org/10.1146/annurev-psych-010814-015321

Gosling, S. D., Vazire, S., Srivastava, S., & John, O. P. (2004). Should We Trust Web-Based Studies? A Comparative Analysis of Six Preconceptions About Internet Questionnaires. *American Psychologist*, *59*(2), 93–104. https://doi.org/10.1037/0003-066X.59.2.93

Graham-Rowe, E., Jessop, D. C., & Sparks, P. (2014). Identifying motivations and barriers to minimising household food waste. *Resources, Conservation and Recycling*, *84*, 15–23. https://doi.org/10.1016/j.resconrec.2013.12.005

Green, T., & Peloza, J. (2014). Finding the Right Shade of Green: The Effect of Advertising Appeal Type on Environmentally-friendly Consumption. *Journal of Advertising*, *43*(2), 128–141. https://doi.org/10.1080/00913367.2013.834805

Gregory-Smith, D., Wells, V. K., Manika, D., & Graham, S. (2014). An environmental social marketing intervention among employees: assessing attitude and behaviour change. *Journal of Marketing Management*, *31*(3–4), 336–377. https://doi.org/10.1080/0267257X.2014.971045

Grudgings, N., Hagen-Zanker, A., Hughes, S., Gatersleben, B., Woodall, M., & Bryans, W. (2018). Why don't more women cycle? An analysis of female and male commuter cycling mode-share in England and Wales. *Journal of Transport & Health*, *10*, 272–283. https://doi.org/10.1016/j.jth.2018.07.004

Hagel, K., Milinski, M., & Marotzke, J. (2017). The level of climate-change mitigation depends on how humans assess the risk arising from missing the 2°C target. *Palgrave Communications*, *3*, 17027. https://doi.org/10.1057/palcomms.2017.27

Hagger, M. S., Chatzisarantis, N. L. D., Alberts, H., Anggono, C. O., Batailler, C., Birt, A. R., … Zwienenberg, M. (2016). A Multilab Preregistered Replication of the Ego-Depletion Effect. *Perspectives on Psychological Science*, *11*(4), 546–573. https://doi.org/10.1177/1745691616652873

Hagger, M. S. (2013). The multiple pathways by which self-control predicts behavior. *Frontiers in Psychology*, *4*. https://doi.org/10.3389/fpsyg.2013.00849

Hagger, M. S., Wood, C., Stiff, C., & Chatzisarantis, N. L. D. (2010). Ego Depletion and the Strength Model of Self-Control: A Meta-Analysis. *Psychological Bulletin*, *136*(4), 495–525. https://doi.org/10.1037/a0019486

Hahnel, U. J. J., Ortmann, C., Korcaj, L., & Spada, H. (2014). What is green worth to you? Activating environmental values lowers price sensitivity towards electric vehicles. *Journal of Environmental Psychology*, *40*, 306–319. https://doi.org/10.1016/j.jenvp.2014.08.002

Hamburg, M. E., & Pronk, T. M. (2015). Believe you can and you will: The belief in high self-control decreases interest in attractive alternatives. *Journal of Experimental Social Psychology*, *56*, 30–35. https://doi.org/10.1016/j.jesp.2014.08.009

Hankonen, N., Kinnunen, M., Absetz, P., & Jallinoja, P. (2014). Why Do People High in Self-Control Eat More Healthily? Social Cognitions as Mediators. *Annals of Behavioral Medicine*, *47*(2), 242–248. https://doi.org/10.1007/s12160-013-9535-1

Happy Kittens. (2010). *Classroom Computer Diagram* [Online]. Retrieved from https://images-wixmp-ed30a86b8c4ca887773594c2.wixmp.com/intermediary/f/a37e596e-3cac-42c4-979c-41a629e1d3b3/d2y8xn1-4415da21-40cb-41f9-b542-331ef0778f09.png

Haq, G., Cambridge, H., & Owen, A. (2013). A targeted social marketing approach for community pro-environmental behavioural change. *Local Environment*, *18*(10), 1134–1152. https://doi.org/10.1080/13549839.2013.787974

Harris, P. R., Brearley, I., Sheeran, P., Barker, M., Klein, W. M. P., Creswell, J. D., … Bond, R. (2014). Combining self-affirmation with implementation intentions to promote fruit and vegetable consumption. *Health Psychology*, *33*(7), 729–736. https://doi.org/10.1037/hea0000065

Hartmann, P., Apaolaza, V., D'souza, C., Barrutia, J. M., & Echebarria, C. (2014). Environmental threat appeals in green advertising: The role of fear arousal and coping efficacy. *International Journal of Advertising*, *33*(4), 741–765. https://doi.org/10.2501/IJA-33-4-741-765

Hawcroft, L. J., & Milfont, T. L. (2010). The use (and abuse) of the new environmental paradigm scale over the last 30 years: A meta-analysis. *Journal of Environmental Psychology*, *30*(2), 143–158. https://doi.org/10.1016/j.jenvp.2009.10.003

Haws, K. L. (2016). Enhancing self-control in consumer decisions. *Current Opinion in Psychology*, *10*, 118–123. https://doi.org/10.1016/j.copsyc.2015.10.026

Haws, K. L., Bearden, W. O., & Nenkov, G. Y. (2012). Consumer spending self-control effectiveness and outcome elaboration prompts. *Journal of the Academy of Marketing Science*, *40*(5), 695–710. https://doi.org/10.1007/s11747-011-0249-2

Haws, K. L., Davis, S. W., & Dholakia, U. M. (2016). Control over What? Individual Differences in General Versus Eating and Spending Self-Control. *Journal of Public Policy & Marketing*, *35*(1), 37–57. https://doi.org/10.1509/jppm.14.149

Hayes, A. (2018). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach* (2nd ed.). New York: The Guilford Press. Retrieved from http://www.guilford.com/p/hayes3

Hayes, A. F., & Matthes, J. (2009). Computational procedures for probing interactions in OLS and logistic regression: SPSS and SAS implementations. *Behavior Research Methods*, *41*(3), 924–936. https://doi.org/10.3758/BRM.41.3.924

Haynes, A., Kemps, E., & Moffitt, R. (2016). Does trait self-control predict weaker desire for unhealthy stimuli? A lab-based study of unhealthy snack intake. *Personality and Individual Differences*, *89*, 69–74. https://doi.org/10.1016/j.paid.2015.09.049

Heathcote, A., Popiel, S. J., & Mewhort, D. J. (1991). Analysis of response time distributions: An example using the Stroop task. *Psychological Bulletin*, *109*(2), 340–347. https://doi.org/10.1037/0033-2909.109.2.340

Hedlund, T. (2011). The impact of values, environmental concern, and willingness to accept economic sacrifices to protect the environment on tourists' intentions to buy ecologically sustainable tourism alternatives. *Tourism and Hospitality Research*, *11*(4), 278–288. https://doi.org/10.1177/1467358411423330

Henrich, J., Heine, S. J., & Norenzayan, A. (2010). The weirdest people in the world? *Behavioral and Brain Sciences*, *33*(2–3), 61–83. https://doi.org/10.1017/S0140525X0999152X

Hester, R., Dixon, V., & Garavan, H. (2006). A consistent attentional bias for drug-related material in active cocaine users across word and picture versions of the emotional

Stroop task. *Drug and Alcohol Dependence*, *81*(3), 251–257. https://doi.org/10.1016/j.drugalcdep.2005.07.002

Hewson, C. (2015). Research methods on the Internet. In L. Cantoni & J. A. Danowski (Eds.), *Communication and technology*. Berlin: De Gruyter Mouton. https://doi.org/10.1515/9783110271355-016

Hicks, J. L., Marsh, R. L., & Cook, G. I. (2005). Task interference in time-based, event-based, and dual intention prospective memory conditions. *Journal of Memory and Language*, *53*(3), 430–444. https://doi.org/10.1016/j.jml.2005.04.001

Hobman, E. V., & Frederiks, E. R. (2014). Barriers to green electricity subscription in Australia: "Love the environment, love renewable energy … but why should I pay more?" *Energy Research & Social Science*, *3*, 78–88. https://doi.org/10.1016/j.erss.2014.07.009

Hoek, A. C., Pearson, D., James, S. W., Lawrence, M. A., & Friel, S. (2017). Shrinking the food-print: A qualitative study into consumer perceptions, experiences and attitudes towards healthy and environmentally-friendly food behaviours. *Appetite*, *108*, 117–131. https://doi.org/10.1016/j.appet.2016.09.030

Hoffman, E., & Daugherty, T. (2013). Is a Picture Always Worth a Thousand Words? Attention to Structural Elements of eWOM for Consumer Brands within Social Media. *Advances in Consumer Research*, *41*, 326–331.

Hofmann, W., Baumeister, R. F., Förster, G., & Vohs, K. D. (2012). Everyday temptations: An experience sampling study of desire, conflict, and self-control. *Journal of Personality and Social Psychology*, *102*(6), 1318–1335. https://doi.org/10.1037/a0026545

Hofmann, W., Friese, M., & Strack, F. (2009). Impulse and Self-Control From a Dual-Systems Perspective. *Perspectives on Psychological Science*, *4*(2), 162–176. https://doi.org/10.1111/j.1745-6924.2009.01116.x

Holland, R. W., Aarts, H., & Langendam, D. (2006). Breaking and creating habits on the working floor: A field-experiment on the power of implementation intentions. *Journal*

of Experimental Social Psychology, *42*(6), 776–783. https://doi.org/10.1016/j.jesp.2005.11.006

Honkanen, P., Olsen, S. O., Verplanken, B., & Tuu, H. H. (2012). Reflective and impulsive influences on unhealthy snacking. The moderating effects of food related self-control. *Appetite*, *58*(2), 616–622. https://doi.org/10.1016/j.appet.2011.11.019

Hopewell, J., Dvorak, R., & Kosior, E. (2009). Plastics recycling: challenges and opportunities. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences*, *364*(1526), 2115–2126. https://doi.org/10.1098/rstb.2008.0311

Howell, R. A. (2014). Investigating the Long-Term Impacts of Climate Change Communications on Individuals' Attitudes and Behavior. *Environment and Behavior*, *46*(1), 70–101. https://doi.org/10.1177/0013916512452428

Huang, H. (2016). Media use, environmental beliefs, self-efficacy, and pro-environmental behavior. *Journal of Business Research*, *69*(6), 2206–2212. https://doi.org/10.1016/j.jbusres.2015.12.031

Huber, S., Nuerk, H.-C., Reips, U.-D., & Soltanlou, M. (2017). Individual differences influence two-digit number processing, but not their analog magnitude processing: a large-scale online study. *Psychological Research*, 1-21. https://doi.org/10.1007/s00426-017-0964-5

Huffman, A. H., Van Der Werff, B. R., Henning, J. B., & Watrous-Rodriguez, K. (2014). When do recycling attitudes predict recycling? An investigation of self-reported versus observed behavior. *Journal of Environmental Psychology*, *38*, 262–270. https://doi.org/10.1016/j.jenvp.2014.03.006

Husted, B. W., Russo, M. V., Meza, C. E. B., & Tilleman, S. G. (2014). An exploratory study of environmental attitudes and the willingness to pay for environmental certification in Mexico. *Journal of Business Research*, *67*(5), 891–899. https://doi.org/10.1016/j.jbusres.2013.07.008

Imhoff, R., Schmidt, A. F., & Gerstenberg, F. (2014). Exploring the Interplay of Trait Self-Control and Ego Depletion: Empirical Evidence for Ironic Effects: Ironic effects of self-

control. *European Journal of Personality*, *28*(5), 413–424. https://doi.org/10.1002/per.1899

Inman, J. J., Winer, R. S., & Ferraro, R. (2009). The Interplay among Category Characteristics, Customer Characteristics, and Customer Activities on in-Store Decision Making. *Journal of Marketing*, *73*(5), 19–29. https://doi.org/10.1509/jmkg.73.5.19

IPCC. (2014a). Summary for Policymakers. In: *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

IPCC. (2014b). Summary for Policymakers. In: *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.*)]*. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA: IPCC.

IPCC. (2018). *Summary for Policymakers. In: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*. Geneva, Switzerland: World Meteorological Organization.

Jackson, T. (2009). *Prosperity without growth: The transition to a sustainable economy*. Sustainable Development Commission.

Jamnik, M. R., & Lane, D. J. (2017). The Use of Reddit as an Inexpensive Source for High-Quality Data. *Practical Assessment, Research and Evaluation*, *22*(5), 1–10.

Jersakova, R., Moulin, C. J. A., & O'Connor, A. R. (2016). Investigating the Role of Assessment Method on Reports of Déjà Vu and Tip-of-the-Tongue States during

Standard Recognition Tests. *PLOS ONE*, *11*(4), e0154334. https://doi.org/10.1371/journal.pone.0154334

Jesson, J. (2009). Household Waste Recycling Behavior: A Market Segmentation Model. *Social Marketing Quarterly*, *15*(2), 25–38. https://doi.org/10.1080/15245000902957326

Job, V., Walton, G. M., Bernecker, K., & Dweck, C. S. (2013). Beliefs about willpower determine the impact of glucose on self-control. *Proceedings of the National Academy of Sciences*, *110*(37), 14837–14842. https://doi.org/10.1073/pnas.1313475110

Job, V., Bernecker, K., Miketta, S., & Friese, M. (2015). Implicit theories about willpower predict the activation of a rest goal following self-control exertion. *Journal of Personality and Social Psychology*, *109*(4), 694–706. https://doi.org/10.1037/pspp0000042

Job, V., Dweck, C. S., & Walton, G. M. (2010). Ego Depletion—Is It All in Your Head?: Implicit Theories About Willpower Affect Self-Regulation. *Psychological Science*, *21*(11), 1686–1693. https://doi.org/10.1177/0956797610384745

Job, V., Friese, M., & Bernecker, K. (2015). Effects of practicing self-control on academic performance. *Motivation Science*, *1*(4), 219–232. https://doi.org/10.1037/mot0000024

Job, V., Walton, G. M., Bernecker, K., & Dweck, C. S. (2015). Implicit theories about willpower predict self-regulation and grades in everyday life. *Journal of Personality and Social Psychology*, *108*(4), 637–647. https://doi.org/10.1037/pspp0000014

Johnson, E. J., Shu, S. B., Dellaert, B. G. C., Fox, C., Goldstein, D. G., Häubl, G., … Weber, E. U. (2012). Beyond nudges: Tools of a choice architecture. *Marketing Letters*, *23*(2), 487–504. https://doi.org/10.1007/s11002-012-9186-1

Johnstone, M. L., & Tan, L. P. (2015). Exploring the Gap Between Consumers' Green Rhetoric and Purchasing Behaviour. *Journal of Business Ethics*, *132*(2), 311–328. https://doi.org/10.1007/s10551-014-2316-3

Joinson, A. (1999). Social desirability, anonymity, and internet-based questionnaires. *Behavior Research Methods, Instruments, & Computers*, *31*(3), 433–438. https://doi.org/10.3758/BF03200723

Joireman, J. (2005). Environmental Problems as Social Dilemmas: The Temporal Dimension. In *Understanding behavior in the context of time: Theory, research, and application.* (pp. 289–304). Mahwah, NJ: Lawrence Erlbaum Associates Publishers.

Kahneman, D. (2011). *Thinking, fast and slow.* New York: Farrar, Straus and Giroux.

Kaiser, F. G., Wolfing Kast, S., & Fuhrer, U. (1999). Environmental attitude and ecological behaviour. *Journal of Environmental Psychology*, *19*, 1–19. https://doi.org/10.1006/jevp.1998.0107

Keizer, K., Lindenberg, S., & Steg, L. (2014). Doing field studies. What is it all about? *Group Processes & Intergroup Relations*, *17*(3), 404–410. https://doi.org/10.1177/1368430213510750

Keller, C., & Hartmann, C. (2016). Not merely a question of self-control: The longitudinal effects of overeating behaviors, diet quality and physical activity on dieters' perceived diet success. *Appetite*, *107*, 213–221. https://doi.org/10.1016/j.appet.2016.08.007

Keller, C., Hartmann, C., & Siegrist, M. (2016). The association between dispositional self-control and longitudinal changes in eating behaviors, diet quality, and BMI. *Psychology & Health*, *31*(11), 1311–1327. https://doi.org/10.1080/08870446.2016.1204451

Keller, P. A., & Block, L. G. (1997). Vividness effects: A resource-matching perspective. *Journal of Consumer Research*, *24*(3), 295–304. https://doi.org/10.1086/209511

Kelly, D., Harper, D. J., & Landau, B. (2008). Questionnaire mode effects in interactive information retrieval experiments. *Evaluation of Interactive Information Retrieval Systems*, *44*(1), 122–141. https://doi.org/10.1016/j.ipm.2007.02.007

Kim, I. M. (2009). *Pleasant Landscape 9057* [Acrylic on canvas]. Retrieved from https://artsandculture.google.com/asset/qQE6g0Hbam9Nng

Kinnunen, M. I., Suihko, J., Hankonen, N., Absetz, P., & Jallinoja, P. (2012). Self-Control is Associated with Physical Activity and Fitness among Young Males. *Behavioral Medicine*, *38*(3), 83–89. https://doi.org/10.1080/08964289.2012.693975

Kisilius, J., & Sternthal, B. (1984). Detecting and Explaining Vividness Effects in Attitudinal Judgments. *Journal of Marketing Research*, *21*(1), 54. https://doi.org/10.2307/3151792

Klöckner, C. A. (2013). A comprehensive model of the psychology of environmental behaviour—A meta-analysis. *Global Environmental Change*, *23*(5), 1028–1038. https://doi.org/10.1016/j.gloenvcha.2013.05.014

Klöckner, C. A., & Oppedal, I. O. (2011). General vs. domain specific recycling behaviour—Applying a multilevel comprehensive action determination model to recycling in Norwegian student homes. *Resources, Conservation and Recycling*, *55*(4), 463–471. https://doi.org/10.1016/j.resconrec.2010.12.009

Knäuper, B., McCollam, A., Rosen-Brown, A., Lacaille, J., Kelso, E., & Roseman, M. (2011). Fruitful plans: adding targeted mental imagery to implementation intentions increases fruit consumption. *Psychology & Health*, *26*(5), 601–617. https://doi.org/10.1080/08870441003703218

Knäuper, B., Roseman, M., Johnson, P. J., & Krantz, L. H. (2009). Using Mental Imagery to Enhance the Effectiveness of Implementation Intentions. *Current Psychology*, *28*(3), 181–186. https://doi.org/10.1007/s12144-009-9055-0

Knussen, C., & Yule, F. (2008). "I'm Not in the Habit of Recycling": The Role of Habitual Behavior in the Disposal of Household Waste. *Environment and Behavior*, *40*(5), 683–702. https://doi.org/10.1177/0013916507307527

Knussen, C., Yule, F., MacKenzie, J., & Wells, M. (2004). An analysis of intentions to recycle household waste: The roles of past behaviour, perceived habit, and perceived lack of facilities. *Journal of Environmental Psychology*, *24*(2), 237–246. https://doi.org/10.1016/j.jenvp.2003.12.001

Koch, A. K., & Nafziger, J. (2009). Motivational goal bracketing. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1490473

Kocher, M. G., Martinsson, P., Myrseth, K. O. R., & Wollbrant, C. E. (2016). Strong, bold, and kind: self-control and cooperation in social dilemmas. *Experimental Economics*, *20*(1), 44–69. https://doi.org/10.1007/s10683-015-9475-7

Kollmuss, A., & Agyeman, J. (2002). Mind the Gap: Why Do People Behave Environmentally and What are the Barriers to Pro-Environmental Behaviour. *Environmental Education Research*, *8*(3), 239–260. https://doi.org/10.1080/1350462022014540

Kormos, C., & Gifford, R. (2014). The validity of self-report measures of proenvironmental behavior: A meta-analytic review. *Journal of Environmental Psychology*, *40*, 359–371. https://doi.org/10.1016/j.jenvp.2014.09.003

Kosinski, M., Matz, S. C., Gosling, S. D., Popov, V., & Stillwell, D. (2015). Facebook as a research tool for the social sciences: Opportunities, challenges, ethical considerations, and practical guidelines. *American Psychologist*, *70*(6), 543–556. https://doi.org/10.1037/a0039210

Kotler, P., Roberto, N., & Lee, N. (2002). *Social marketing: Improving the Quality of Life* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Krantz, J. (n.d.). Psychological Research on the Net. Retrieved 20 July 2018, from https://psych.hanover.edu/research/exponnet.html

Kraut, R., Olson, J., Banaji, M., Bruckman, A., Cohen, J., & Couper, M. (2004). Psychological Research Online: Report of Board of Scientific Affairs' Advisory Group on the Conduct of Research on the Internet. *American Psychologist*, *59*(2), 105–117. https://doi.org/10.1037/0003-066X.59.2.105

Kroese, F. M., Evers, C., & De Ridder, D. T. D. (2009). How chocolate keeps you slim. The effect of food temptations on weight watching goal importance, intentions, and eating behavior. *Appetite*, *53*(3), 430–433. https://doi.org/10.1016/j.appet.2009.08.002

Krugman, H. E. (1965). The impact of television advertising: Learning without involvement. *Public Opinion Quarterly*, *29*(3), 349–356. https://doi.org/10.1086/267335

Kurz, T., Donaghue, N., Rapley, M., & Walker, I. (2005). The ways that people talk about natural resources: discursive strategies as barriers to environmentally sustainable practices. *The British Journal of Social Psychology*, 44(4), 603–620. https://doi.org/10.1348/014466604X18064

Lange, F., Brückner, C., Kröger, B., Beller, J., & Eggert, F. (2014). Wasting ways: Perceived distance to the recycling facilities predicts pro-environmental behavior. *Resources, Conservation and Recycling*, *92*, 246–254. https://doi.org/10.1016/j.resconrec.2014.07.008

Lange, F., & Eggert, F. (2014). Sweet delusion. Glucose drinks fail to counteract ego depletion. *Appetite*, *75*, 54–63. https://doi.org/10.1016/j.appet.2013.12.020

Lange, F., Seer, C., Rapior, M., Rose, J., & Eggert, F. (2014). Turn It All You Want: Still No Effect of Sugar Consumption on Ego Depletion. *Journal of European Psychology Students*, *5*(3), 1–8. https://doi.org/10.5334/jeps.cc

Larsen, R. J., Mercer, K. A, & Balota, D. A. (2006). Lexical characteristics of words used in emotional Stroop experiments. *Emotion (Washington, D.C.)*, *6*(1), 62–72. https://doi.org/10.1037/1528-3542.6.1.62

Lee, G., & Lee, W. J. (2009). Psychological reactance to online recommendation services. *Information & Management*, *46*(8), 448–452. https://doi.org/10.1016/j.im.2009.07.005

Lee, L., Amir, O., & Ariely, D. (2009). In Search of Homo Economicus: Cognitive Noise and the Role of Emotion in Preference Consistency. *Journal of Consumer Research*, *36*(2), 173–187. https://doi.org/10.1086/597160

Lefebvre, R. C. (2011). An integrative model for social marketing. *Journal of Social Marketing*, 1(1), 54–72. https://doi.org/10.1108/20426761111104437

Lehner, M., Mont, O., & Heiskanen, E. (2016). Nudging – A promising tool for sustainable consumption behaviour? *Journal of Cleaner Production*, *134*, 166–177. https://doi.org/10.1016/j.jclepro.2015.11.086

Lewis, I., Watson, B., & White, K. M. (2009). Internet versus paper-and-pencil survey methods in psychological experiments: Equivalence testing of participant responses to health-related messages. *Australian Journal of Psychology*, *61*(2), 107–116. https://doi.org/10.1080/00049530802105865

Lin, L., & McFerran, B. (2016). The (Ironic) Dove Effect: Use of Acceptance Cues for Larger Body Types Increases Unhealthy Behaviors. *Journal of Public Policy & Marketing*, *35*(1), 76–90. https://doi.org/10.1509/jppm.14.020

Lindenberg, S., & Steg, L. (2007). Normative, Gain and Hedonic Goal Frames Guiding Environmental Behavior. *Journal of Social Issues*, *63*(1), 117–137. https://doi.org/10.1111/j.1540-4560.2007.00499.x

Lindsay, J. J., & Strathman, A. (1997). Predictors of recycling behavior: an application of a modified health belief model1. *Journal of Applied Social Psychology*, *27*(20), 1799–1823.

Liu, Y., Hong, Z., Zhu, J., Yan, J., Qi, J., & Liu, P. (2018). Promoting green residential buildings: Residents' environmental attitude, subjective knowledge, and social trust matter. *Energy Policy*, *112*, 152–161. https://doi.org/10.1016/j.enpol.2017.10.020

Loewenstein, G. (1996). Out of Control: Visceral Influence on Behavior. *Organizational Behavior and Human Decision Processes*, *65*(3), 272–292.

Logan, G D. (1980). Attention and automaticity in Stroop and priming tasks: theory and data. *Cognitive Psychology*, *12*(4), 523–553. https://doi.org/10.1016/0010-0285(80)90019-5

Logan, G. D, & Zbrodoff, N. J. (1998). Stroop-Type Interference : Congruity Effects in Color Naming With Typewritten Responses, *24*(3), 978–992.

Lowery, B. S., Eisenberger, N. I., Hardin, C. D., & Sinclair, S. (2007). Long-term Effects of Subliminal Priming on Academic Performance. *Basic and Applied Social Psychology*, *29*(2), 151–157. https://doi.org/10.1080/01973530701331718

Lurquin, J. H., McFadden, S. L., & Harbke, C. R. (2014). An electrophysiological investigation of the effects of social rejection on self control. *The Journal of Social Psychology*, *154*(3), 186–197. https://doi.org/10.1080/00224545.2014.881768

Lutz, K. A., & Lutz, R. J. (1977). Effects of interactive imagery on learning: Application to advertising. *Journal of Applied Psychology*, *62*(4), 493–498. https://doi.org/10.1037/0021-9010.62.4.493

MacFayden, L., Stead, M., & Hastings, G. (1999). A Synopsis of Social Marketing. *Health Promotion International*, *9*, 59–63.

MacInnis, D. J., & Price, L. L. (1987). The Role of Imagery in Information Processing: Review and Extensions. *Journal of Consumer Research*, *13*(4), 473. https://doi.org/10.1086/209082

Magnusson, M. K., Arvola, A., Hursti, U.-K. K., Åberg, L., & Sjödén, P.-O. (2003). Choice of organic foods is related to perceived consequences for human health and to environmentally-friendly behaviour. *Appetite*, *40*(2), 109–117. https://doi.org/10.1016/S0195-6663(03)00002-3

Mainieri, T., Barnett, E. G., Valdero, T. R., Unipan, J. B., & Oskamp, S. (1997). Green Buying: The Influence of Environmental Concern on Consumer Behavior. *Journal of Social Psychology*, *137*(2), 189–204. https://doi.org/10.1080/00224549709595430

Mancha, R. M., & Yoder, C. Y. (2015). Cultural antecedents of green behavioral intent: An environmental theory of planned behavior. *Journal of Environmental Psychology*, *43*, 145–154. https://doi.org/10.1016/j.jenvp.2015.06.005

Mann, T., de Ridder, D. T. D., & Fujita, K. (2013). Self-regulation of health behavior: Social psychological approaches to goal setting and goal striving. *Health Psychology*, *32*(5), 487–498. https://doi.org/10.1037/a0028533

Mannetti, L., Pierro, A., & Livi, S. (2004). Recycling: Planned and self-expressive behaviour. *Journal of Environmental Psychology*, *24*(2), 227–236. https://doi.org/10.1016/j.jenvp.2004.01.002

Martinsson, P., Myrseth, K. O. R., & Wollbrant, C. (2012). Reconciling pro-social vs. selfish behavior: On the role of self-control. *Judgment and Decision Making*, *7*(3), 304–315.

Martinsson, P., Myrseth, K. O. R., & Wollbrant, C. (2014). Social dilemmas: When self-control benefits cooperation. *Journal of Economic Psychology*, *45*, 213–236. https://doi.org/10.1016/j.joep.2014.09.004

Mason, W., & Suri, S. (2012). Conducting behavioral research on Amazon's Mechanical Turk. *Behavior Research Methods*, *44*(1), 1–23. https://doi.org/10.3758/s13428-011-0124-6

Mattern, J. L., & Neighbors, C. (2004). Social norms campaigns: examining the relationship between changes in perceived norms and changes in drinking levels. *Journal of Studies on Alcohol*, *65*(4), 489–493. https://doi.org/10.15288/jsa.2004.65.489

McCrea, S. M., Penningroth, S. L., & Radakovich, M. P. (2014). Implementation intentions forge a strong cue–response link and boost prospective memory performance. *Journal of Cognitive Psychology*, *27*(1), 12–26. https://doi.org/10.1080/20445911.2014.975816

McDaniel, M. A., Guynn, M. J., Einstein, G. O., & Breneiser, J. (2004). Cue-Focused and Reflexive-Associative Processes in Prospective Memory Retrieval. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *30*(3), 605–614. https://doi.org/10.1037/0278-7393.30.3.605

McDaniel, M. A., Howard, D. C., & Butler, K. M. (2008). Implementation intentions facilitate prospective memory under high attention demands. *Memory & Cognition*, *36*(4), 716–724. https://doi.org/10.3758/MC.36.4.716

McDaniel, M. A., & Scullin, M. K. (2010). Implementation intention encoding does not automatize prospective memory responding. *Memory & Cognition*, *38*(2), 221–232. https://doi.org/10.3758/MC.38.2.221

McFarland, C., & Glisky, E. L. (2012). Implementation intentions and imagery: individual and combined effects on prospective memory among young adults. *Memory & Cognition, 40*(1), 62–69. https://doi.org/10.3758/s13421-011-0126-8

Meeks, J. T., & Marsh, R. L. (2009). Implementation intentions about nonfocal event-based prospective memory tasks. *Psychological Research, 74*(1), 82–89. https://doi.org/10.1007/s00426-008-0223-x

Meier, A., Reinecke, L., & Meltzer, C. E. (2016). "Facebocrastination"? Predictors of using Facebook for procrastination and its effects on students' well-being. *Computers in Human Behavior, 64*, 65–76. https://doi.org/10.1016/j.chb.2016.06.011

Meneses, G. D., & Palacio, A. B. (2005). Recycling Behavior: A Multidimensional Approach. *Environment and Behavior*, 37(6), 837–860. https://doi.org/10.1177/0013916505276742

Metcalfe, J., & Mischel, W. (1999). A hot/cool-system analysis of delay of gratification: Dynamics of willpower. *Psychological Review, 106*(1), 3–19. https://doi.org/10.1037/0033-295X.106.1.3

Miles, E., Sheeran, P., Baird, H., Macdonald, I., Webb, T. L., & Harris, P. R. (2016). Does self-control improve with practice? Evidence from a six-week training program. *Journal of Experimental Psychology: General, 145*(8), 1075–1091. https://doi.org/10.1037/xge0000185

Milfont, T. L. (2009). The effects of social desirability on self-reported environmental attitudes and ecological behaviour. *Environmentalist, 29*(3), 263–269. https://doi.org/10.1007/s10669-008-9192-2

Milfont, T. L., & Duckitt, J. (2004). The structure of environmental attitudes: A first- and second-order confirmatory factor analysis. *Journal of Environmental Psychology, 24*(3), 289–303. https://doi.org/10.1016/j.jenvp.2004.09.001

Milfont, T. L., & Duckitt, J. (2010). The environmental attitudes inventory: A valid and reliable measure to assess the structure of environmental attitudes. *Journal of Environmental Psychology*, *30*(1), 80–94. https://doi.org/10.1016/j.jenvp.2009.09.001

Milfont, T. L., Duckitt, J., & Cameron, L. D. (2006). A Cross-Cultural Study of Environmental Motive Concerns and Their Implications for Proenvironmental Behavior. *Environment and Behavior*, *38*(6), 745–767. https://doi.org/10.1177/0013916505285933

Milfont, T. L., & Markowitz, E. (2016). Sustainable consumer behavior: a multilevel perspective. *Consumer Behavior*, *10*, 112–117. https://doi.org/10.1016/j.copsyc.2015.12.016

Miller, D. W., Hadjimarcou, J., & Miciak, A. (2000). A scale for measuring advertisement-evoked mental imagery. *Journal of Marketing Communications*, *6*(1), 1–20.

Miller, E. M., Walton, G. M., Dweck, C. S., Job, V., Trzesniewski, K. H., & McClure, S. M. (2012). Theories of Willpower Affect Sustained Learning. *PLoS ONE*, *7*(6), e38680. https://doi.org/10.1371/journal.pone.0038680

Miniard, P. W., Bhatla, S., Lord, K. R., Dickson, P. R., & Unnava, H. R. (1991). Picture-Based Persuasion Processes and the Moderating Role of Involvement. *Journal of Consumer Research*, *18*(1), 92–107.

Mischel, W., Shoda, Y., & Rodriguez, M. L. (1989). Delay of gratification in children. *Science*, *244*(4907), 933–938.

Mitchell, A. A., & Olson, J. C. (1981). Are product attribute beliefs the only mediator of advertising effects on brand attitude? *Journal of Marketing Research*, *18*(3), 318–332. https://doi.org/10.2307/3150973

Mobley, C., Vagias, W. M., & DeWard, S. L. (2010). Exploring Additional Determinants of Environmentally Responsible Behavior: The Influence of Environmental Literature and Environmental Attitudes. *Environment and Behavior*, *42*(4), 420–447. https://doi.org/10.1177/0013916508325002

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., … Caspi, A. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences*, *108*(7), 2693–2698. https://doi.org/10.1073/pnas.1010076108

Momsen, K., & Stoerk, T. (2014). From intention to action: Can nudges help consumers to choose renewable energy? *Energy Policy*, *74*, 376–382. https://doi.org/10.1016/j.enpol.2014.07.008

Morten, A., Gatersleben, B., & Jessop, D. C. (2018). Staying grounded? Applying the theory of planned behaviour to explore motivations to reduce air travel. *Transportation Research Part F: Traffic Psychology and Behaviour*, *55*, 297–305. https://doi.org/10.1016/j.trf.2018.02.038

Mukhopadhyay, A., & Johar, G. V. (2005). Where there is a will, is there a way? Effects of lay theories of self-control on setting and keeping resolutions. *Journal of Consumer Research*, *31*(4), 779–786.

Mukhopadhyay, A., Sengupta, J., & Ramanathan, S. (2008). Recalling Past Temptations: An Information-Processing Perspective on the Dynamics of Self-Control. *Journal of Consumer Research*, *35*(4), 586–599. https://doi.org/10.1086/591105

Muraven, M. (2010). Building Self-Control Strength: Practicing Self-Control Leads to Improved Self-Control Performance. *Journal of Experimental Social Psychology*, *46*(2), 465–468. https://doi.org/10.1016/j.jesp.2009.12.011

Muraven, M., & Baumeister, R. F. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle? *Psychological Bulletin*, *126*(2), 247–259. https://doi.org/10.1037/0033-2909.126.2.247

Muraven, M., Collins, R. L., Shiffman, S., & Paty, J. A. (2005). Daily Fluctuations in Self-Control Demands and Alcohol Intake. *Psychology of Addictive Behaviors*, *19*(2), 140–147. https://doi.org/10.1037/0893-164X.19.2.140

Muraven, M., & Slessareva, E. (2003). Mechanisms of Self-Control Failure: Motivation and Limited Resources. *Personality and Social Psychology Bulletin, 29*(7), 894–906. https://doi.org/10.1177/0146167203029007008

Murphy, S., Nordin, S., & Cumming, J. (2008). Imagery in sport, exercise, and dance. In T. Horn (Ed.), *Advances in Sport Psychology*, 3rd ed. (pp. 297-324). Champaign, IL: Human Kinetics.

Mutter, S. A., Naylor, J. C., & Patterson, E. R. (2005). The effects of age and task context on Stroop task performance. *Memory & Cognition*, *33*(3), 514–530. https://doi.org/10.3758/BF03193068

Myrseth, K. O. R., & Fishbach, A. (2009). Self-control: A function of knowing when and how to exercise restraint. *Current Directions in Psychological Science*, *18*(4), 247–252.

Nielsen, K. S. (2017). From prediction to process: A self-regulation account of environmental behavior change. *Journal of Environmental Psychology*, *51*, 189–198. https://doi.org/10.1016/j.jenvp.2017.04.002

Nigbur, D., Lyons, E., & Uzzell, D. (2010). Attitudes, norms, identity and environmental behaviour: Using an expanded theory of planned behaviour to predict participation in a kerbside recycling programme. *British Journal of Social Psychology*, *49*(2), 259–284. https://doi.org/10.1348/014466609X449395

Nikolova, H., Lamberton, C., & Haws, K. L. (2015). Haunts or helps from the past: Understanding the effect of recall on current self-control. *Journal of Consumer Psychology*, *26*(2), 245–256. https://doi.org/10.1016/j.jcps.2015.06.011

Nisbett, R., & Ross, L. (1980). *Human Inference: Strategies and Shortcomings of Social Judgment*. Englewood Cliffs, NJ: Prentice Hall.

Nolan, J. M., Schultz, P. W., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2008). Normative Social Influence is Underdetected. *Personality and Social Psychology Bulletin*, *34*(7), 913–923. https://doi.org/10.1177/0146167208316691

Nowak, G. J., Gellin, B. G., MacDonald, N. E., & Butler, R. (2015). Addressing vaccine hesitancy: The potential value of commercial and social marketing principles and practices. *Vaccine*, *33*(34), 4204–4211. https://doi.org/10.1016/j.vaccine.2015.04.039

Oaten, M., & Cheng, K. (2010). Longitudinal gains in self-regulation from regular physical exercise. *British Journal of Health Psychology*, *11*(4), 717–733. https://doi.org/10.1348/135910706X96481

O'Connor, J., & Keil, M. (2017). The effects of construal level and small wins framing on an individual's commitment to an environmental initiative. *Journal of Environmental Psychology*, *52*, 1–10. https://doi.org/10.1016/j.jenvp.2017.04.010

Ohler, A. M., & Billger, S. M. (2014). Does environmental concern change the tragedy of the commons? Factors affecting energy saving behaviors and electricity usage. *Ecological Economics*, 107, 1–12. https://doi.org/10.1016/j.ecolecon.2014.07.031

Olli, E., Grendstad, G., & Wollebaek, D. (2001). Correlates of Environmental Behaviors: Bringing Back Social Context. *Environment & Behavior*, *33*(2), 181–208. https://doi.org/10.1177/00139160121972945

Onwezen, M. C., Antonides, G., & Bartels, J. (2013). The Norm Activation Model: An exploration of the functions of anticipated pride and guilt in pro-environmental behaviour. *Journal of Economic Psychology*, *39*, 141–153. https://doi.org/10.1016/j.joep.2013.07.005

Orbell, S., Hodgkins, S., & Sheeran, P. (1997). Implementation Intentions and the Theory of Planned Behavior. *Personality and Social Psychology Bulletin*, *23*(9), 945–954. https://doi.org/10.1177/0146167297239004

Osgood, J. M., & Muraven, M. (2015). Self-Control Depletion Does Not Diminish Attitudes About Being Prosocial But Does Diminish Prosocial Behaviors. *Basic and Applied Social Psychology*, *37*(1), 68–80. https://doi.org/10.1080/01973533.2014.996225

Osman, M. (2004). An evaluation of dual-process theories of reasoning. *Psychonomic Bulletin & Review*, *11*(6), 988–1010. https://doi.org/10.3758/BF03196730

Ozaki, Y., Goto, T., Kobayashi, M., & Hofmann, W. (2017). Counteractive control over temptations: Promoting resistance through enhanced perception of conflict and goal value. *Self and Identity*, *16*(4), 439–459. https://doi.org/10.1080/15298868.2016.1269668

Paolacci, G., & Chandler, J. (2014). Inside the Turk: Understanding Mechanical Turk as a Participant Pool. *Current Directions in Psychological Science*, *23*(3), 184–188. https://doi.org/10.1177/0963721414531598

Paolacci, G., Chandler, J., & Ipeirotis, P. G. (2010). Running experiments on Amazon Mechanical Turk. *Judgment and Decision Making*, *5*(5), 411–419.

Papista, E., & Krystallis, A. (2013). Investigating the Types of Value and Cost of Green Brands: Proposition of a Conceptual Framework. *Journal of Business Ethics*, *115*(1), 75–92. https://doi.org/10.1007/s10551-012-1367-6

Parks-Stamm, E. J., Gollwitzer, P. M., & Oettingen, G. (2010). Implementation intentions and test anxiety: Shielding academic performance from distraction. *Learning and Individual Differences*, *20*(1), 30–33. https://doi.org/10.1016/j.lindif.2009.09.001

Peattie, K., & Crane, A. (2005). Green marketing: legend, myth, farce or prophesy? *Qualitative Market Research: An International Journal*, *8*(4), 357–370. https://doi.org/10.1108/13522750510619733

Peattie, K., & Peattie, S. (2009). Social marketing: A pathway to consumption reduction? *Journal of Business Research*, *62*(2), 260–268. https://doi.org/10.1016/j.jbusres.2008.01.033

Perrin, D., & Barton, J. (2001). Issues associated with transforming household attitudes and opinions into materials recovery: a review of two kerbside recycling schemes. *Resources, Conservation and Recycling*, *33*(1), 61–74.

Peters, G. P., Andrew, R. M., Canadell, J. G., Fuss, S., Jackson, R. B., Korsbakken, J. I., … Nakicenovic, N. (2017). Key indicators to track current progress and future ambition of the Paris Agreement. *Nature Climate Change*, *7*, 118.

Petrova, P. K., & Cialdini, R. B. (2005). Fluency of Consumption Imagery and the Backfire Effects of Imagery Appeals. *Journal of Consumer Research*, *32*(3), 442–452. https://doi.org/10.1086/497556

Pew Research Center. (2016). *The politics of climate*. Pew Research Center.

Pham, L. B., & Taylor, S. E. (1999). From Thought to Action: Effects of Process-Versus Outcome-Based Mental Simulations on Performance. *Personality and Social Psychology Bulletin*, *25*(2), 250–260. https://doi.org/10.1177/0146167299025002010

Pham, M. T., Lee, L., & Stephen, A. T. (2012). Feeling the Future: The Emotional Oracle Effect. *Journal of Consumer Research*, *39*(3), 461–477. https://doi.org/10.1086/663823

Pieters, R., & Wedel, M. (2004). Attention Capture and Transfer in Advertising: Brand, Pictorial, and Text-Size Effects. *Journal of Marketing*, *68*(2), 36–50. https://doi.org/10.1509/jmkg.68.2.36.27794

Piquero, A. R., Jennings, W. G., & Farrington, D. P. (2010). On the Malleability of Self-Control: Theoretical and Policy Implications Regarding a General Theory of Crime. *Justice Quarterly*, *27*(6), 803–834. https://doi.org/10.1080/07418820903379628

Plous, S. (n.d.). Online Social Psychology Studies. Retrieved from https://www.socialpsychology.org/expts.htm

Potter, S. J., Moynihan, M. M., & Stapleton, J. G. (2011). Using Social Self-Identification in Social Marketing Materials Aimed at Reducing Violence Against Women on Campus. *Journal of Interpersonal Violence*, *26*(5), 971–990. https://doi.org/10.1177/0886260510365870

Potter, S. J., Moynihan, M. M., Stapleton, J. G., & Banyard, V. L. (2009). Empowering Bystanders to Prevent Campus Violence Against Women: A Preliminary Evaluation of a Poster Campaign. *Violence Against Women*, *15*(1), 106–121. https://doi.org/10.1177/1077801208327482

Prati, G., Albanesi, C., & Pietrantoni, L. (2017). The interplay among environmental attitudes, pro-environmental behavior, social identity, and pro-environmental institutional

climate. A longitudinal study. *Environmental Education Research*, *23*(2), 176–191. https://doi.org/10.1080/13504622.2015.1118752

Price, M., Higgs, S., & Lee, M. (2017). Self-control mediates the relationship between time perspective and BMI. *Appetite*, *108*, 156–160. https://doi.org/10.1016/j.appet.2016.09.034

Rabinovich, A., Morton, T. A., Postmes, T., & Verplanken, B. (2012). Collective self and individual choice: The effects of inter-group comparative context on environmental values and behaviour. *British Journal of Social Psychology*, 51(4), 551–569. https://doi.org/10.1111/j.2044-8309.2011.02022.x

Ramo, D. E., & Prochaska, J. J. (2012). Broad Reach and Targeted Recruitment Using Facebook for an Online Survey of Young Adult Substance Use. *Journal of Medical Internet Research*, *14*(1), e28. https://doi.org/10.2196/jmir.1878

Ramsey, S. R., Thompson, K. L., McKenzie, M., & Rosenbaum, A. (2016). Psychological research in the internet age: The quality of web-based data. *Computers in Human Behavior*, *58*, 354–360. https://doi.org/10.1016/j.chb.2015.12.049

Randall, D. M., & Fernandes, M. F. (1991). The Social Desirability Response Bias in Ethics Research. *Journal of Business Ethics*, *10*(11), 805–817.

Rausch, J. R., Maxwell, S. E., & Kelley, K. (2003). Analytic Methods for Questions Pertaining to a Randomized Pretest, Posttest, Follow-Up Design. *Journal of Clinical Child & Adolescent Psychology*, *32*(3), 467–486. https://doi.org/10.1207/S15374424JCCP3203_15

Read, D., Loewenstein, G., & Rabin, M. (1999). Choice Bracketing. *Journal of Risk and Uncertainty*, *19*(1/3), 171–197.

Reddit. (n.d.). Reddit Sample Size. Retrieved from https://www.reddit.com/r/SampleSize/

Rees, H. R., Rivers, A. M., & Sherman, J. W. (2018). Implementation Intentions Reduce Implicit Stereotype Activation and Application. *Personality and Social Psychology Bulletin*, *45*(1), 37–53. https://doi.org/10.1177/0146167218775695

Reicher, S. D., Spears, R., and Haslam, S. A. (2010). The social identity approach in social psychology. In: M. S. Wetherell and C. T. Mohanty (Eds.). *Sage Handbook of Identities* (pp. 45-62). London: Sage.

Reips, U. D. (2002). Standards for Internet-Based Experimenting. *Experimental Psychology*, *49*(4), 243–256. https://doi.org/10.1027//1618-3169.49.4.243

Reno, R. R., Cialdini, R. B., & Kallgren, C. A. (1993). The transsituational influence of social norms. *Journal of Personality and Social Psychology*, *64*(1), 104–112. https://doi.org/10.1037/0022-3514.64.1.104

Rezvani, Z., Jansson, J., & Bodin, J. (2015). Advances in consumer electric vehicle adoption research: A review and research agenda. *Transportation Research Part D: Transport and Environment*, *34*, 122–136. https://doi.org/10.1016/j.trd.2014.10.010

Richards, M. B., Wollenberg, E., & van Vuuren, D. (2018). National contributions to climate change mitigation from agriculture: allocating a global target. *Climate Policy*, *18*(10), 1271–1285. https://doi.org/10.1080/14693062.2018.1430018

Rife, S. C., Cate, K. L., Kosinski, M., & Stillwell, D. (2016). Participant recruitment and data collection through Facebook: the role of personality factors. *International Journal of Social Research Methodology*, *19*(1), 69–83. https://doi.org/10.1080/13645579.2014.957069

Riva, G., Teruzzi, T., & Anolli, L. (2003). The Use of the Internet in Psychological Research: Comparison of Online and Offline Questionnaires. *CyberPsychology & Behavior*, *6*(1), 73–80. https://doi.org/10.1089/109493103321167983

Roberts, J. A., & Bacon, D. R. (1997). Exploring the Subtle Relationships between Environmental Concern and Ecologically Conscious Consumer Behavior. *Journal of Business Research*, *40*(1), 79–89. https://doi.org/10.1016/S0148-2963(96)00280-9

Robinson, A. C., Downey, L. A., Ford, T. C., Lomas, J. E., & Stough, C. (2019). Green teens: Investigating the role of emotional intelligence in adolescent environmentalism.

Personality and Individual Differences, *138*, 225–230. https://doi.org/10.1016/j.paid.2018.10.009

Roelofs, A. (2003). Goal-referenced selection of verbal action: Modeling attentional control in the Stroop task. *Psychological Review*, *110*(1), 88–125. https://doi.org/10.1037/0033-295X.110.1.88

Rokeach, M. (1973). *The nature of human values.* New York: Free Press.

Rossiter, J. R., & Percy, L. (1980). Attitude Change through Visual Imagery in Advertising. *Journal of Advertising*, *9*(2), 10–16. https://doi.org/10.1080/00913367.1980.10673313

Ruepert, A. M., Keizer, K., & Steg, L. (2017). The relationship between Corporate Environmental Responsibility, employees' biospheric values and pro-environmental behaviour at work. *Journal of Environmental Psychology*, *54*, 65–78. https://doi.org/10.1016/j.jenvp.2017.10.006

Rummel, J., Einstein, G. O., & Rampey, H. (2012). Implementation-intention encoding in a prospective memory task enhances spontaneous retrieval of intentions. *Memory*, *20*(8), 803–817. https://doi.org/10.1080/09658211.2012.707214

Ryan, R. S., Wilde, M., & Crist, S. (2013). Compared to a small, supervised lab experiment, a large, unsupervised web-based experiment on a previously unknown effect has benefits that outweigh its potential costs. *Computers in Human Behavior*, *29*(4), 1295–1301. https://doi.org/10.1016/j.chb.2013.01.024

Salonen, A. O., & Åhlberg, M. (2013). Obstacles to sustainable living in the Helsinki Metropolitan Area. *Sustainable Cities and Society*, *8*, 48–55. https://doi.org/10.1016/j.scs.2013.01.001

Savani, K., & Job, V. (2017). Reverse ego-depletion: Acts of self-control can improve subsequent performance in Indian cultural contexts. *Journal of Personality and Social Psychology*, *113*(4), 589–607. https://doi.org/10.1037/pspi0000099

Schmeichel, B. J. (2007). Attention control, memory updating, and emotion regulation temporarily reduce the capacity for executive control. *Journal of Experimental Psychology: General*, *136*(2), 241–255. https://doi.org/10.1037/0096-3445.136.2.241

Schmeichel, B. J., & Vohs, K. (2009). Self-affirmation and self-control: Affirming core values counteracts ego depletion. *Journal of Personality and Social Psychology*, *96*(4), 770–782. https://doi.org/10.1037/a0014635

Schnitzspahn, K. M., & Kliegel, M. (2009). Age effects in prospective memory performance within older adults: the paradoxical impact of implementation intentions. *European Journal of Ageing*, *6*(2), 147–155. https://doi.org/10.1007/s10433-009-0116-x

Schubert, C. (2017). Green nudges: Do they work? Are they ethical? *Ecological Economics*, *132*, 329–342. https://doi.org/10.1016/j.ecolecon.2016.11.009

Schultz, P. W., Nolan, J. M., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2007). Research Article: The Constructive, Destructive, and Reconstructive Power of Social Norms. *Psychological Science*, *18*(5), 429. https://doi.org/10.1111/j.1467-9280.2007.01917.x

Schultz, P. W., & Oskamp, S. (1996). Effort as a Moderator of the Attitude-Behavior Relationship: General Environmental Concern and Recycling. *Social Psychology Quarterly*, *59*(4), 375. https://doi.org/10.2307/2787078

Schultz, P. W., & Zelezny, L. (1999). Values as predictors of environmental attitudes: Evidence for consistency across 14 countries. *Journal of Environmental Psychology*, *19*(3), 255–265.

Schwartz, S. H. (1992). Universals in the Content and Structure of Values: Theoretical Advances and Empirical Tests in 20 Countries. In M. P. Zanna (Ed.), *Advances in Experimental Social Psychology* (Vol. 25, pp. 1–65). New York: Academic Press. https://doi.org/10.1016/S0065-2601(08)60281-6

Schwartz, S. H. (2012). An Overview of the Schwartz Theory of Basic Values. *Online Readings in Psychology and Culture*, *2*(1). https://doi.org/10.9707/2307-0919.1116

Schwarz, N. (1999). Self-reports: How the questions shape the answers. *American Psychologist*, *54*(2), 93–105. https://doi.org/10.1037/0003-066X.54.2.93

Schwarz, N., Bless, H., Strack, F., Klumpp, G., Rittenauer-Schatka, H., & Simons, A. (1991). Ease of Retrieval as Information: Another Look at the Availability Heuristic. *Journal of Personality and Social Psychology*, *61*(2), 195–202.

Scullin, M. K., McDaniel, M. A., Shelton, J. T., & Lee, J. H. (2010). Focal/nonfocal cue effects in prospective memory: monitoring difficulty or different retrieval processes? *Journal of Experimental Psychology. Learning, Memory, and Cognition*, *36*(3), 736–749. https://doi.org/10.1037/a0018971

Sevincer, A. T., Schlier, B., & Oettingen, G. (2015). Ego depletion and the use of mental contrasting. *Motivation and Emotion*, *39*(6), 876–891. https://doi.org/10.1007/s11031-015-9508-8

Shatz, I. (2017). Fast, Free, and Targeted: Reddit as a Source for Recruiting Participants Online. *Social Science Computer Review*, *35*(4), 537–549. https://doi.org/10.1177/0894439316650163

Sheeran, P. (2002). Intention—Behavior Relations: A Conceptual and Empirical Review. *European Review of Social Psychology*, *12*(1), 1–36. https://doi.org/10.1080/14792772143000003

Sheeran, P., & Silverman, M. (2003). Evaluation of three interventions to promote workplace health and safety: Evidence for the utility of implementation intentions. *Social Science and Medicine*, *56*(10), 2153–2163. https://doi.org/10.1016/S0277-9536(02)00220-4

Shieh, G. (2011). Clarifying the role of mean centring in multicollinearity of interaction effects. *British Journal of Mathematical and Statistical Psychology*, *64*(3), 462–477. https://doi.org/10.1111/j.2044-8317.2010.02002.x

Shin, Y. H., Moon, H., Jung, S. E., & Severt, K. (2017). The effect of environmental values and attitudes on consumer willingness to pay more for organic menus: A value-attitude-

behavior approach. *Journal of Hospitality and Tourism Management*, *33*, 113–121. https://doi.org/10.1016/j.jhtm.2017.10.010

Simon, J. R., & Berbaum, K. (1990). Effect of conflicting cues on information processing: The 'Stroop effect' vs. the 'Simon effect'. *Acta Psychologica*, *73*(2), 159–170. https://doi.org/10.1016/0001-6918(90)90077-S

Slovic, P., Finucane, M. L., Peters, E., & MacGregor, D. G. (2004). Risk as Analysis and Risk as Feelings: Some Thoughts about Affect, Reason, Risk, and Rationality. *Risk Analysis*, *24*(2), 311–322. https://doi.org/10.1111/j.0272-4332.2004.00433.x

Sniehotta, F. F. (2009). An Experimental Test of the Theory of Planned Behavior. *Applied Psychology: Health and Well-Being*, *1*(2), 257–270. https://doi.org/10.1111/j.1758-0854.2009.01013.x

Sniehotta, F. F., Presseau, J., & Araújo-Soares, V. (2014). Time to retire the theory of planned behaviour. *Health Psychology Review*, *8*(1), 1–7. https://doi.org/10.1080/17437199.2013.869710

Sparks, P., & Shepherd, R. (1992). Self-Identity and the Theory of Planned Behavior: Assessing the Role of Identification with "Green Consumerism". *Social Psychology Quarterly*, *55*(4), 388–399.

Sparks, P., Jessop, D. C., Chapman, J., & Holmes, K. (2010). Pro-environmental actions, climate change, and defensiveness: Do self-affirmations make a difference to people's motives and beliefs about making a difference? *British Journal of Social Psychology*, *49*(3), 553–568. https://doi.org/10.1348/014466609X471976

Spilker-Attig, A., & Brettel, M. (2010). Effectiveness of online advertising channels: a price-level-dependent analysis. *Journal of Marketing Management*, *26*(3–4), 343–360. https://doi.org/10.1080/02672571003594663

Sproesser, G., Strohbach, S., Schupp, H., & Renner, B. (2011). Candy or apple? How self-control resources and motives impact dietary healthiness in women. *Appetite*, *56*(3), 784–787. https://doi.org/10.1016/j.appet.2011.01.028

Stadler, M., Aust, M., Becker, N., Niepel, C., & Greiff, S. (2016). Choosing between what you want now and what you want most: Self-control explains academic achievement beyond cognitive ability. *Personality and Individual Differences*, *94*, 168–172. https://doi.org/10.1016/j.paid.2016.01.029

Stanovich, K. E., & West, R. F. (2000). Individual differences in reasoning: Implications for the rationality debate? *Behavioral and Brain Sciences*, *23*(5), 645–665.

Stead, M., Arnott, L., & Dempsey, E. (2012). Healthy Heroes, Magic Meals, and a Visiting Alien: Community-Led Assets-Based Social Marketing. *Social Marketing Quarterly*, *19*(1), 26–39. https://doi.org/10.1177/1524500412472493

Steg, L., Bolderdijk, J. W., Keizer, K., & Perlaviciute, G. (2014). An Integrated Framework for Encouraging Pro-environmental Behaviour: The role of values, situational factors and goals. *Journal of Environmental Psychology*, *38*, 104–115. https://doi.org/10.1016/j.jenvp.2014.01.002

Steg, L., Dreijerink, L., & Abrahamse, W. (2005). Factors influencing the acceptability of energy policies: A test of VBN theory. *Journal of Environmental Psychology*, *25*(4), 415–425. https://doi.org/10.1016/j.jenvp.2005.08.003

Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology*, *29*(3), 309–317. https://doi.org/10.1016/j.jenvp.2008.10.004

Stern, P. C. (1999). Information, Incentives, and Proenvironmental Consumer Behavior. *Journal of Consumer Policy*, *22*(4), 461–478. https://doi.org/10.1023/A:1006211709570

Stern, P. C. (2000). New environmental theories: toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, *56*(3), 407–424.

Stern, P. C. (2011). Contributions of Psychology to Limiting Climate Change. *American Psychologist*, *66*(4), 303–314. https://doi.org/10.1037/a0023235

Stern, P. C., & Dietz, T. (1994). The Value Basis of Environmental Concern. *Journal of Social Issues*, *50*(3), 65–84. https://doi.org/10.1111/j.1540-4560.1994.tb02420.x

Stern, P. C., Dietz, T., Abel, T., Guagnano, G. A., & Kalof, L. (1999). A Value-Belief-Norm Theory of Support for Social Movements: The Case of Environmentalism. *Human Ecology Review*, *6*(2), 17.

Stillman, T. F., Tice, D. M., Fincham, F. D., & Lambert, N. M. (2009). The Psychological Presence of Family Improves Self-Control. *Journal of Social and Clinical Psychology*, *28*(4), 498–529. https://doi.org/10.1521/jscp.2009.28.4.498

Stroop, J. R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology*, *18*(6), 643–662. https://doi.org/10.1037/h0054651

Swim, J. K., Stern, P. C., Doherty, T. J., Clayton, S., Reser, J. P., Weber, E. U., … Howard, G. S. (2011). Psychology's contributions to understanding and addressing global climate change. *American Psychologist*, *66*(4), 241–250. https://doi.org/10.1037/a0023220

Tajfel, H., & Turner, J. C. (1979). An Integrative Theory of Intergroup Conflict. In W. G. Austin, & S. Worchel (Eds.), *The Social Psychology of Intergroup Relations* (pp. 33-47). Monterey, CA: Brooks/Cole.

Tam, K. P., & Chan, H. W. (2017). Environmental concern has a weaker association with pro-environmental behavior in some societies than others: A cross-cultural psychology perspective. *Journal of Environmental Psychology*, *53*, 213–223. https://doi.org/10.1016/j.jenvp.2017.09.001

Tangney, J. P., Baumeister, R. F., Boone, A. L., Tangney, J. P., Baumeister, R. F., & Boone, A. L. (2004). High Self- Control Predicts Good Adjustment, Less Pathology, Better Grades, and Interpersonal Success. *Journal of Personality*, *72*(2), 271–324. https://doi.org/10.1111/j.0022-3506.2004.00263.x

Tauber, S. K., Dunlosky, J., Rawson, K. A., Rhodes, M. G., & Sitzman, D. M. (2013). General knowledge norms: Updated and expanded from the Nelson and Narens (1980) norms. *Behavior Research Methods*, *45*(4), 1115–1143. https://doi.org/10.3758/s13428-012-0307-9

Terry, D. J., Hogg, M. A., & White, K. M. (1999). The theory of planned behaviour: Self-identity, social identity and group norms. *British Journal of Social Psychology*, *38*(3), 225–244. https://doi.org/10.1348/014466699164149

Thaler, R. H., & Sunstein, C. R. (2008). *Nudge: Improving decisions about health, wealth, and happiness*. New Haven: Yale University Press.

Thøgersen, J. (2005). How May Consumer Policy Empower Consumers for Sustainable Lifestyles? *Journal of Consumer Policy*, *28*(2), 143–177. https://doi.org/10.1007/s10603-005-2982-8

Thøgersen, J., & Ölander, F. (2002). Human values and the emergence of a sustainable consumption pattern: A panel study. *Journal of Economic Psychology*, *23*(5), 605–630. https://doi.org/10.1016/S0167-4870(02)00120-4

Thøgersen, J., & Ölander, F. (2006). The Dynamic Interaction of Personal Norms and Environment-Friendly Buying Behavior: A Panel Study. *Journal of Applied Social Psychology*, *36*(7), 1758–1780. https://doi.org/10.1111/j.0021-9029.2006.00080.x

Tobler, C., Visschers, V. H. M., & Siegrist, M. (2012). Addressing climate change: Determinants of consumers' willingness to act and to support policy measures. *Journal of Environmental Psychology*, *32*(3), 197–207. https://doi.org/10.1016/j.jenvp.2012.02.001

Tomasone, J. R., Meikle, N., & Bray, S. R. (2015). Intentions and Trait Self-control Predict Fruit and Vegetable Consumption During the Transition to First-Year University. *Journal of American College Health*, *63*(3), 172–179. https://doi.org/10.1080/07448481.2014.1003375

Tonglet, M., Phillips, P. S., & Bates, M. P. (2004). Determining the drivers for householder pro-environmental behaviour: waste minimisation compared to recycling. *Resources, Conservation and Recycling*, *42*(1), 27–48. https://doi.org/10.1016/j.resconrec.2004.02.001

Tonglet, M., Phillips, P. S., & Read, A. D. (2004). Using the Theory of Planned Behaviour to investigate the determinants of recycling behaviour: A case study from Brixworth, UK. *Resources, Conservation and Recycling*, *41*(3), 191–214. https://doi.org/10.1016/j.resconrec.2003.11.001

Trope, Y., & Fishbach, A. (2000). Counteractive self-control in overcoming temptation. *Journal of Personality and Social Psychology*, *79*(4), 493–506. https://doi.org/10.1037//0022-3514.79.4.493

Trope, Y., & Liberman, N. (2003). Temporal construal. *Psychological Review*, *110*(3), 403–421. https://doi.org/10.1037/0033-295X.110.3.403

Truong, V. D. (2014). Social Marketing: A Systematic Review of Research 1998–2012. *Social Marketing Quarterly*, *20*(1), 15–34. https://doi.org/10.1177/1524500413517666

UK Government. (2018). Climate change explained. Retrieved from www.gov.uk

UNFCCC. (2015). *Synthesis report on the aggregate effect of the intended nationally determined contributions*. Paris: United Nations Framework Convention on Climate Change.

Vadillo, M. A., Gold, N., & Osman, M. (2016). The bitter truth about sugar and willpower: The limited evidential value of the glucose model of ego depletion. *Psychological Science*, *27*(9), 1207–1214.

van de Ven, D. J., González-Eguino, M., & Arto, I. (2018). The potential of behavioural change for climate change mitigation: a case study for the European Union. *Mitigation and Adaptation Strategies for Global Change*, *23*(6), 853–886. https://doi.org/10.1007/s11027-017-9763-y

Van der Elst, W., Van Boxtel, M. P. J., Van Breukelen, G. J. P., & Jolles, J. (2006). The Stroop Color-Word Test: Influence of Age, Sex, and Education; and Normative Data for a Large Sample Across the Adult Age Range. *Assessment*, *13*(1), 62–79. https://doi.org/10.1177/1073191105283427

van der Werff, E., Steg, L., & Keizer, K. (2013). The value of environmental self-identity: The relationship between biospheric values, environmental self-identity and environmental preferences, intentions and behaviour. *Journal of Environmental Psychology*, *34*, 55–63. https://doi.org/10.1016/j.jenvp.2012.12.006

van Dijk, E., De Cremer, D., & Handgraaf, M. J. (2004). Social value orientations and the strategic use of fairness in ultimatum bargaining. *Journal of Experimental Social Psychology*, *40*(6), 697–707. https://doi.org/10.1016/j.jesp.2004.03.002

van Koningsbruggen, G. M., Stroebe, W., Papies, E. K., & Aarts, H. (2011). Implementation intentions as goal primes: Boosting self-control in tempting environments. *European Journal of Social Psychology*, *41*(5), 551–557. https://doi.org/10.1002/ejsp.799

van Steenbergen, H., Band, G. P. H., & Hommel, B. (2015). Does conflict help or hurt cognitive control? Initial evidence for an inverted U-shape relationship between perceived task difficulty and conflict adaptation. *Frontiers in Psychology*, *6*. https://doi.org/10.3389/fpsyg.2015.00974

vanDellen, M. R., & Hoyle, R. H. (2010). Regulatory Accessibility and Social Influences on State Self-Control. *Personality and Social Psychology Bulletin*, *36*(2), 251–263. https://doi.org/10.1177/0146167209356302

Vannette, D. (2017). Using Attention Checks in Your Surveys May Harm Data Quality. Retrieved 20 July 2018, from https://www.qualtrics.com/blog/using-attention-checks-in-your-surveys-may-harm-data-quality/

Velema, E., Vyth, E. L., & Steenhuis, I. H. M. (2017). Using nudging and social marketing techniques to create healthy worksite cafeterias in the Netherlands: intervention development and study design. *BMC Public Health*, *17*(1). https://doi.org/10.1186/s12889-016-3927-7

Verplanken, B., & Holland, R. W. (2002). Motivated decision making: effects of activation and self-centrality of values on choices and behavior. *Journal of Personality and Social Psychology*, *82*(3), 434–447. https://doi.org/10.1037/0022-3514.82.3.434

Vining, J., Linn, N., & Burdge, R. J. (1992). Why recycle? A comparison of recycling motivations in four communities. *Environmental Management*, 16(6), 785–797. https://doi.org/10.1007/BF02645669

Vohs, K. D., & Faber, R. J. (2007). Spent resources: Self-regulatory resource availability affects impulse buying. *Journal of Consumer Research*, *33*(4), 537–547. https://doi.org/10.1086/510228

Vohs, K. D., & Heatherton, T. F. (2000). Self-Regulatory Failure: A Resource-Depletion Approach. *Psychological Science, 11(3)*, 249–254.

Wäger, P. A., & Hischier, R. (2015). Life cycle assessment of post-consumer plastics production from waste electrical and electronic equipment (WEEE) treatment residues in a Central European plastics recycling plant. *Science of The Total Environment*, *529*, 158–167. https://doi.org/10.1016/j.scitotenv.2015.05.043

Wagner, T. P. (2013). Examining the concept of convenient collection: An application to extended producer responsibility and product stewardship frameworks. *Waste Management*, *33*(3), 499–507. https://doi.org/10.1016/j.wasman.2012.06.015

Wang, C., Zhang, J., Yu, P., & Hu, H. (2018). The theory of planned behavior as a model for understanding tourists' responsible environmental behaviors: The moderating role of environmental interpretations. *Journal of Cleaner Production*, *194*, 425–434. https://doi.org/10.1016/j.jclepro.2018.05.171

Wang, Y., Wang, L., Cui, X., Fang, Y., Chen, Q., Wang, Y., & Qiang, Y. (2015). Eating on impulse: Implicit attitudes, self-regulatory resources, and trait self-control as determinants of food consumption. *Eating Behaviors*, *19*, 144–149. https://doi.org/10.1016/j.eatbeh.2015.09.011

Webb, T. L., Christian, J., & Armitage, C. J. (2007). Helping students turn up for class: Does personality moderate the effectiveness of an implementation intention intervention? *Learning and Individual Differences*, *17*(4), 316–327. https://doi.org/10.1016/j.lindif.2007.03.001

Webb, T. L., & Sheeran, P. (2003). Can implementation intentions help to overcome ego-depletion? *Journal of Experimental Social Psychology*, *39*(3), 279–286. https://doi.org/10.1016/S0022-1031(02)00527-9

Webb, T. L., & Sheeran, P. (2007). How do implementation intentions promote goal attainment? A test of component processes. *Journal of Experimental Social Psychology*, *43*(2), 295–302. https://doi.org/10.1016/j.jesp.2006.02.001

Weigel, R., & Weigel, J. (1978). Environmental Concern: The Development of a Measure. *Environment and Behavior*, *10*(1), 3–15. https://doi.org/10.1177/0013916578101001

Wendlandt, M., & Schrader, U. (2007). Consumer reactance against loyalty programs. *Journal of Consumer Marketing*, *24*(5), 293–304. https://doi.org/10.1108/07363760710773111

Wertenbroch, K. (1998). Consumption Self-Control by Rationing Purchase Quantities of Virtue and Vice. *Marketing Science*, *17*(4,), 317–337.

Whitburn, J., Linklater, W. L., & Milfont, T. L. (2018). Exposure to Urban Nature and Tree Planting Are Related to Pro-Environmental Behavior via Connection to Nature, the Use of Nature for Psychological Restoration, and Environmental Attitudes. *Environment and Behavior*, 001391651775100. https://doi.org/10.1177/0013916517751009

Whitmarsh, L., & O'Neill, S. (2010). Green identity, green living? The role of pro-environmental self-identity in determining consistency across diverse pro-environmental behaviours. *Journal of Environmental Psychology*, *30*(3), 305–314. https://doi.org/10.1016/j.jenvp.2010.01.003

WHO. (2016). *Preventing disease through healthy environments: a global assessment of the burden of disease from environmental risks*. Geneva, Switzerland: World Health Organisation Department of Public Health, Environmental and Social Determinants of Health. Retrieved from http://www.who.int/quantifying_ehimpacts/publications/preventing-disease/en/

Wieber, F., Gollwitzer, P. M., & Sheeran, P. (2014). Strategic regulation of mimicry effects by implementation intentions. *Journal of Experimental Social Psychology, 53,* 31–39. https://doi.org/10.1016/j.jesp.2014.02.002

Wilkie, W. (1990). *Consumer behaviour* (2nd ed.). New York: Wiley.

Wilkinson, R., & Pickett, K. (2018). *The Inner Level*. Milton Keynes: Allen Lane.

Wills, T. A., Isasi, C. R., Mendoza, D., & Ainette, M. G. (2007). Self-Control Constructs Related to Measures of Dietary Intake and Physical Activity in Adolescents. *Journal of Adolescent Health, 41*(6), 551–558. https://doi.org/10.1016/j.jadohealth.2007.06.013

Wynes, S., & Nicholas, K. A. (2017). The climate mitigation gap: education and government recommendations miss the most effective individual actions. *Environmental Research Letters, 12*(7), 074024. https://doi.org/10.1088/1748-9326/aa7541

Yadav, R., & Pathak, G. S. (2017). Determinants of Consumers' Green Purchase Behavior in a Developing Nation: Applying and Extending the Theory of Planned Behavior. *Ecological Economics, 134,* 114–122. https://doi.org/10.1016/j.ecolecon.2016.12.019

Zhang, H., Zhao, H., Liu, J., Xu, Y., & Lu, H. (2015). The dampening effect of employees' future orientation on cyberloafing behaviors: the mediating role of self-control. *Frontiers in Psychology, 6*. https://doi.org/10.3389/fpsyg.2015.01482

Appendices

Appendix A – Measures used in Chapter 3

Items marked (R) were reversed.

Brief Self-Control Scale (Tangney et al. 2004)

Please indicate how much each of the following statements reflects how you typically are (Not at all 1 – Very much 5).

1. I am good at resisting temptation.
2. I have a hard time breaking bad habits. (R)
3. I am lazy. (R)
4. I say inappropriate things. (R)
5. I do certain things that are bad for me, if they are fun. (R)
6. I refuse things that are bad for me.
7. I wish I had more self-discipline. (R)
8. People would say that I have iron self- discipline.
9. Pleasure and fun sometimes keep me from getting work done. (R)
10. I have trouble concentrating. (R)
11. I am able to work effectively toward long-term goals.
12. Sometimes I can't stop myself from doing something, even if I know it is wrong. (R)
13. I often act without thinking through all the alternatives. (R)

Pro-environmental behaviour scale (Barbaro & Pickett, 2015)

Please indicate how often you take each action: never (0), occasionally (1), often (2), always (3)

1. Turn off lights you're not using
2. Drive economically (e.g., braking or accelerating gently)
3. Walk, cycle or take public transport for short journeys (i.e., trips of less than 3 miles)
4. Use an alternative to travelling (e.g., shopping online)
5. Share a car journey with someone else
6. Cut down on the amount you fly
7. Buy environmentally-friendly products
8. Eat food which is organic, locally-grown or in season
9. Avoid eating meat

10. Buy products with less packaging
11. Recycle
12. Reuse or repair items instead of throwing them away
13. Compost your kitchen waste
14. Save water by taking shorter showers
15. Turn off the tap while you brush your teeth
16. Write to your MP about an environmental issue
17. Take part in a protest about an environmental issue

Ten-Item New Environmental Paradigm (NEP) (Clark et al., 2003)

1. The balance of nature is very delicate and easily upset.
2. Plants and animals have as much right as humans to exist.
3. Humans will eventually learn enough about how nature works to be able to control it. (R)
4. The so-called ‘‘ecological crisis’’ facing humankind has been greatly exaggerated. (R)
5. If things continue on their present course, we will soon experience a major ecological catastrophe.
6. Humans were meant to rule over the rest of nature. (R)
7. The earth is like a spaceship with very limited room and resources.
8. Human ingenuity will insure that we do not make the earth unlivable. (R)
9. We are approaching the limit of the number of people the earth can support.
10. The balance of nature is strong enough to cope with the impacts of modern industrial nations. (R)

Five-item New Environmental Paradigm (NEP) (Stern et al., 1999)

1. The so-called “ecological crisis” facing humankind has been greatly exaggerated. (R)
2. The earth is like a spaceship with limited room and resources.
3. If things continue on their present course, we will soon experience a major ecological catastrophe.
4. The balance of nature is strong enough to cope with the impacts of modern industrial nations. (R)
5. Humans are severely abusing the environment.

Appendix B – Measures used in Chapter 5

Trivia Questions (Tauber et al., 2013)

The correct answer for each question is in bold; when the question includes a PM target, this is highlighted next to the response options.

1. What is the only liquid metal at room temperature?

1. iridium **2. mercury** 3. nobelium 4. Zinc

2. What is the capital of Denmark?

1. Oslo 2. Helsinki **3. Copenhagen** 4. Stockholm

3. What is the largest planet in the solar system?

1. Jupiter 2. Saturn 3. Mars 4. Neptune

4. What is the last name of the man who invented dynamite?

1. Einstein **2. Nobel** 3. Newton 4. Faraday

5. What is the last name of the composer who wrote the opera “Don Giovanni”?

1. Puccini **2. Mozart** 3. Verdi 4. Wagner

6. What is the name of deer meat?

1. beef 2. brisket **3. venison** 4. gammon

7. What is the last name of the artist who painted “Guernica”?

1. Dali 2. Cezanne **3. Picasso** 4. Duchamp

8. What is the longest river in South America?

1. Amazon 2. Nile 3. Orinoco 4. Uruguay

9. What is the name of a giant ocean wave caused by an earthquake?

1. typhoon 2. flood 3. tidal bore 4. tsunami **(PM target)**

10. What is the name of the Island on which Napoleon was born?

1. Sicilly **2. Corsica** 3. Sardinia 4. Oleron

11. What kind of poison did Socrates take as his execution?

1. belladonna 2. wolfsbane 3. mandrake **4. Hemlock**

12. What is the name of the instrument used to measure windspeed?

1. barometer 2. psychrometer **3. anemometer** 4. hygrometer

13. What is the last name of the author who wrote "Brothers Karamazov"?

1. Dostoyevsky 2. Tolstoy 3. Cehov 4. Turgenev

14. Of which country is Budapest the capital?

1. Ukraine 2. Slovakia 3. Hungary **4. Romania**

15. What is the name of the city in Italy that is known for its canals?

1. Florence **2. Venice** 3. Rome 4. Milan

16. What is the name of the navigation instrument used at sea to plot position by the stars?

1. Almanac 2. Compass 3. Octant **4. Sextant**

17. What is the name of the largest ocean on Earth?

1. Atlantic 2. Pacific 3. Indian 4. Antarctic **(PM target)**

18. What is the name of the crime in which a person purposely betrays his country?

1. treason 2. contempt of the sovereign 3. sedition 4. embracery

19. Who is known as “the father of Geometry”?

1. Pythagoras 2. Archimedes 3. Thales **4. Euclid**

20. What is John Kenneth Galbraith’s profession?

1. economist 2. paleontologist 3. architect 4. artist

21. Which planet was the last to be discovered?

1. Uranus 2. Saturn **3. Neptune** 4. Venus

22. What is the capital of Canada?

1. Toronto **2. Ottawa** 3. Montreal 4. Vancouver

23. What is the last name of the man who invented the telegraph?

1. Edison **2. Morse** 3. Tesla 4. Bell

24. In which city is Michelangelo's Statue of David located?

1. Florence 2. Venice 3. Rome 4. Milan

25. What is the name of the island-city believed since antiquity to have sunk into the ocean?

1. Atlantis 2. Utopia 3. Avalon 4. Shangri-La **(PM target)**

26. What was Frank Lloyd Wright's profession?

1. economist 2. paleontologist **3. architect** 4. artist

27. Of which country is Nairobi the capital?

1. Kenya 2. Angola 3. Nigeria 4. Libya

28. What famous knot did Alexander the Great undo?

1. versatackle 2. monkey's fist **3. gordian** 4. Grief

29. Which breed of cat has blue eyes?

1. Persian **2. Siamese** 3. Bengal 4. Sphynx

30. What is the unit of sound intensity?

1. hertz **2. decibel** 3. watt 4. Becquerel

31. Which country was the first to use gunpowder?

1. England 2. Spain 3. Japan **4. China**

32. In what European city is the Parthenon located?

1. Athens 2. Istanbul 3. Vilnius 4. Nicosia

33. What is the last name of the astronomer who published in 1543 his theory that the Earth revolves around the Sun?

1. Copernicus 2. Galilei 3. Newton 4. Descartes

34. The deepest part of the ocean is located at which trench?

1. Kuril 2. Philippine 3. Manila 4. Mariana **(PM target)**

35. What is the name of the organ which produces insulin?

1. liver 2. spleen **3. pancreas** 4. gall bladder

36. What is the name of the largest desert on Earth?

1. Antarctica **2. Sahara** 3. Gobi 4. Kalahari

37. What is the name of the North Star?

1. Andromeda 2. Alpha Centauri 3. Sirius **4. Polaris**

38. What is the name of the man who is regarded as the national poet of Scotland?

1. Scott **2. Burns** 3. Wordsworth 4. Blake

39. In what ancient city were the hanging gardens located?

1. Carthage **2. Babylon** 3. Ephesus 4. Machu Picchu

40. What is the name of the process by which plants make their food?

1. photoadaptation 2. photoconversion **3. photosynthesis** 4. photodesorption

41. What is the unit of electrical power that refers to a current of one ampere at one volt?

1. watt 2. joule 3. lumen 4. coulomb

42. What is the last name of the first person to complete a solo flight across the Atlantic ocean?

1. Lindbergh 2. Earhart 3. Wright 4. Bleriot **(PM target)**

43. What is the name of the collarbone?

1. fibula 2. ulna 3. scapula **4. clavicle**

44. What is the name of the horse-like animal with black and white stripes?

1. antelope 2. giraffe **3. zebra** 4. Deer

Appendix C – Ethical approval

University of St Andrews | FOUNDED 1413

University Teaching and Research Ethics Committee

06 October 2015

Dear Andreea

Thank you for submitting your ethical application which was considered by the Ethics Committee on 6th October 2015 when the following documents were reviewed:

1. Ethical Application Form
2. Participant Information Sheet
3. Consent Form
4. Debriefing Form

The School of Management Ethics Committee has been delegated to act on behalf of the University Teaching and Research Ethics Committee (UTREC) and has granted this application ethical approval. The particulars relating to the approved project are as follows -

Approval Code:	MN 11774	**Approved on:**	6/10/15	**Approval Expiry:**	6/10/18
Project Title:	Using implementation intentions, a self-regulatory strategy, to promote pro-environmental behaviours				
Researcher(s):	Andreea Oniga				
Supervisor(s):	Kristian Myrseth, John Desmond				

Approval is awarded for three years. Projects which have not commenced within two years of approval must be re-submitted for review by your School Ethics Committee. If you are unable to complete your research within the 3 three year approval period, you are required to write to your School Ethics Committee Convener to request a discretionary extension of no greater than 6 months or to re-apply if directed to do so, and you should inform your School Ethics Committee when your project reaches completion.

If you make any changes to the project outlined in your approved ethical application form, you should inform your supervisor and seek advice on the ethical implications of those changes from the School Ethics Convener who may advise you to complete and submit an ethical amendment form for review.

Any adverse incident which occurs during the course of conducting your research must be reported immediately to the School Ethics Committee who will advise you on the appropriate action to be taken.

Approval is given on the understanding that you conduct your research as outlined in your application and in compliance with UTREC Guidelines and Policies (http://www.st-andrews.ac.uk/utrec/guidelinespolicies/). You are also advised to ensure that you procure and handle your research data within the provisions of the Data Provision Act 1998 and in accordance with any conditions of funding incumbent upon you.

Yours sincerely

Convener of the School Ethics Committee

cc Supervisor

School of Management Ethics Committee, The Gateway, North Haugh, St Andrews, Fife, KY16 9SS
management.ethics@st-andrews.ac.uk

University of St Andrews | FOUNDED 1413

University Teaching and Research Ethics Committee

10 January 2017

Dear Andreea,

Thank you for submitting your amendment application which comprised the following documents:

1. Ethical Amendment Application Form

The School of Management Ethics Committee is delegated to act on behalf of the University Teaching and Research Ethics Committee (UTREC) and has approved this ethical amendment application. The particulars of this approval are as follows –

Original Approval Code:	MN11774	**Approved on:**	6/10/2015
Amendment Approval Date:	9/1/2017	**Approval Expiry Date:**	6/10/2018
Project Title:	The role of self-control and rationality in pro-environmental behaviour		
Researcher(s):	Andreea Oniga	**Supervisor(s):**	Boyka Bratanova John Desmond Kristian Myrseth

Ethical amendment approval does not extend the originally granted approval period of three years, rather it validate the changes you have made to the originally approved ethical application. If you are unable to complete your research within the original five year validation period, you are required to write to your School Ethics Committee Convener to request a discretionary extension of no greater than 6 months or to re-apply if directed to do so, and you should inform your School Ethics Committee when your project reaches completion.

Any serious adverse events or significant change which occurs in connection with this study and/or which may alter its ethical consideration, must be reported immediately to the School Ethics Committee, and an Ethical Amendment Form submitted where appropriate.

Approval is given on the understanding that you adhere to the 'Guidelines for Ethical Research Practice' (http://www.st-andrews.ac.uk/media/UTRECguidelines%20Feb%2008.pdf).

Yours sincerely

SEC Administrator

cc Supervisor

School of Management Ethics Committee, The Gateway, North Haugh, St Andrews, Fife, KY16 9SS
management.ethics@st-andrews.ac.uk

University of St Andrews | FOUNDED 1413

University Teaching and Research Ethics Committee

Dear Andreea,

Thank you for submitting your amendment application which comprised the following documents:

1. Ethical Amendment Application Form

The School of Management Ethics Committee is delegated to act on behalf of the University Teaching and Research Ethics Committee (UTREC) and has approved this ethical amendment application. The particulars of this approval are as follows –

Original Approval Code:	MN11774	**Approved on:**	6th October 2015
Amendment Approval Date:	18th July 2017	**Approval Expiry Date:**	18th July 2020
Project Title:	The role of self-control and rationality in pro-environmental behaviour		
Researcher(s):	Andreea Oniga	**Supervisor(s):**	Boyka Bratanova, Kristian Myrseth, John Desmond

Ethical amendment approval does not extend the originally granted approval period of three years, rather it validate the changes you have made to the originally approved ethical application. If you are unable to complete your research within the original five year validation period, you are required to write to your School Ethics Committee Convener to request a discretionary extension of no greater than 6 months or to re-apply if directed to do so, and you should inform your School Ethics Committee when your project reaches completion.

Any serious adverse events or significant change which occurs in connection with this study and/or which may alter its ethical consideration, must be reported immediately to the School Ethics Committee, and an Ethical Amendment Form submitted where appropriate.

Approval is given on the understanding that you adhere to the 'Guidelines for Ethical Research Practice' (http://www.st-andrews.ac.uk/media/UTRECguidelines%20Feb%2008.pdf).

Yours sincerely

SEC Administrator

cc Supervisor

School of Management Ethics Committee, The Gateway, North Haugh, St Andrews, Fife, KY16 9SS
management.ethics@st-andrews.ac.uk

University of St Andrews | FOUNDED 1413

University Teaching and Research Ethics Committee

23 October 2017

Dear Andreea,

Thank you for submitting your amendment application which comprised the following documents:

1. Ethical Amendment Application Form

The School of Management Ethics Committee is delegated to act on behalf of the University Teaching and Research Ethics Committee (UTREC) and has approved this ethical amendment application. The particulars of this approval are as follows –

Original Approval Code:	MN11774	**Approved on:**	6th October 2017
Amendment Approval Date:	23rd October 2017	**Approval Expiry Date:**	23rd October 2017
Project Title:	The role of self-control and rationality in pro-environmental behaviour		
Researcher(s):	Andreea Oniga	**Supervisor(s):**	Boyka Bratanova, Kristian Myrseth, John Desmond

Ethical amendment approval does not extend the originally granted approval period of three years, rather it validate the changes you have made to the originally approved ethical application. If you are unable to complete your research within the original five year validation period, you are required to write to your School Ethics Committee Convener to request a discretionary extension of no greater than 6 months or to re-apply if directed to do so, and you should inform your School Ethics Committee when your project reaches completion.

Any serious adverse events or significant change which occurs in connection with this study and/or which may alter its ethical consideration, must be reported immediately to the School Ethics Committee, and an Ethical Amendment Form submitted where appropriate.

Approval is given on the understanding that you adhere to the 'Guidelines for Ethical Research Practice' (http://www.st-andrews.ac.uk/media/UTRECguidelines%20Feb%2008.pdf).

Yours sincerely

SEC Administrator

cc Supervisor

School of Management Ethics Committee, The Gateway, North Haugh, St Andrews, Fife, KY16 9SS
management.ethics@st-andrews.ac.uk

University of St Andrews | FOUNDED 1413

University Teaching and Research Ethics Committee

22 October 2018

Dear Andreea,

Thank you for submitting your amendment application which comprised the following documents:

1. Ethical Amendment Application Form

The School of Management Ethics Committee is delegated to act on behalf of the University Teaching and Research Ethics Committee (UTREC) and has approved this ethical amendment application. The particulars of this approval are as follows –

Original Approval Code:	MN11774	**Approved on:**	6/10/15
Amendment Approval Date:	22nd October 2018	**Approval Expiry Date:**	22nd March 2019
Project Title:	The role of self-control and rationality in pro-environmental behaviour		
Researcher(s):	Andreea Oniga	**Supervisor(s):**	Boyka Bratanova

Ethical amendment approval does not extend the originally granted approval period of three years, rather it validate the changes you have made to the originally approved ethical application. If you are unable to complete your research within the original five year validation period, you are required to write to your School Ethics Committee Convener to request a discretionary extension of no greater than 6 months or to re-apply if directed to do so, and you should inform your School Ethics Committee when your project reaches completion.

Any serious adverse events or significant change which occurs in connection with this study and/or which may alter its ethical consideration, must be reported immediately to the School Ethics Committee, and an Ethical Amendment Form submitted where appropriate.

Approval is given on the understanding that you adhere to the 'Guidelines for Ethical Research Practice' (http://www.st-andrews.ac.uk/media/UTRECguidelines%20Feb%2008.pdf).

Yours sincerely

Convenor of the School Ethics Committee

cc Supervisor

School of Management Ethics Committee, The Gateway, North Haugh, St Andrews, Fife, KY16 9SS
management.ethics@st-andrews.ac.uk